

## Appendix B

# **DESCRIPTIONS OF SIGNIFICANT NON- POINT SOURCES BY SUB-AREA**

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## B.1 Buffalo Sub-area

### B.1.1 Lake Erie Segment

B.1.1.1 Bethlehem Steel - Site 118 (915009) - The Bethlehem Steel site is located in Lackawanna, New York on the New York Erie shore at the south end of the Buffalo Outer Harbor.

The plant site is approximately 890 hectares (2,200 acres) in size, 304 hectares (750 acres) of which consists of fill adjacent to Lake Erie. The fill is mainly slag, cinders, sand, and gravel. Within this fill area spent pickle liquor, tar sludge, ammonia still lime sludge, and metal sludge were deposited.

In general, the geologic sequence at the site is a shale or dolomitic bedrock overlain by glacial till and lake deposits of sand and silt. These units are overlain by peat, sand, gravel, and fill.

Data collected by Bethlehem Steel from monitoring wells along the Lake Erie shore closest to the disposal area in 1980 and 1982 indicate elevated levels of arsenic, cyanide, hexavalent chromium, lead, naphthalene, phenols, and benzene. The maximum and mean values resulting from this monitoring are as follows:

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Arsenic <sup>1/</sup>	90	30
Cyanide <sup>1/</sup>	1,100	160
Chromium <sup>+6</sup>	410	40
Lead <sup>1/</sup>	390	120
Zinc <sup>1/</sup>	380	155
Naphthalene <sup>1/</sup>	290	100
Phenols	7,300	1,337
Benzene <sup>1/</sup>	4	4
Toluene <sup>1/</sup>	1	1

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<sup>1/</sup> EPA priority pollutant

Contaminant migration to Lake Erie is indicated.

**B.1.1.2 Alltift Landfill - Site 162 (915054)** - The Alltift Landfill is located south of the City of Buffalo and is within 1680 metres (5500 feet) of the Buffalo Outer Harbor.

The site is approximately 10.1 hectares (25 acres) in size and has been a disposal site since the 1950's. From the 1950's to the early 1970's, the site was used to dispose of bulk loads of dye, oil sludges, phenolic compounds, chrome sludge, copper sulfate, nitrobenzene, monochlorobenzene, and naphthalene. The total amount of material disposed is unknown.

The landfill was inactive for several years until the late 1970's, when it became an active landfill for the disposal of auto demolition shredder waste, core sands, fly ash, and foundry sand. This practice has continued at a rate of 30,600 to 45,300 cubic metres (40,000 to 60,000 cubic yards) per year. Presently, the disposal area is limited to the northern third of the site.

The geologic data available indicate that the site is underlain by Devonian age limestone and shale which in turn is overlain by tills and lacustrine clay. These units are overlain by alluvium and fill of recent age.

In 1978, seven groundwater samples from wells screened above the glaciolacustrine clay were collected and analyzed by the owner. The parameters analyzed included total Kjeldahl nitrogen (TKN), phenols, total halogenated hydrocarbons, PCBs, arsenic, chromium, copper, lead, and mercury. In 1982, four wells were drilled and screened below the clay. Water samples were collected by the owner from each well and analyzed for the same parameters. The data from the peripheral wells are shown below:

<u>Parameter</u>	<u>Wells Screened Above Clay (ug/L)</u>		<u>Wells Screened Below Clay (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>	<u>Maximum</u>	<u>Mean</u>
TKN as N	125,000	98,000	4,400	28,00
Phenol	89	49,5	ND	ND
Total Organic Carbon	950,000	479,800	9,000	5,300
Total halogenated hydrocarbons	8.42	3.57	ND	ND
Arsenic <sup>1/</sup>	21.3	10.7	ND	ND
Chromium <sup>1/</sup>	16	10	64	49
Copper <sup>1/</sup>	210	43	100	50
Mercury <sup>1/</sup>	10.7	3.2	ND	ND
Silver <sup>1/</sup>	4	2	ND	ND

<sup>1/</sup> EPA priority pollutant

ND Not detected

Elevated levels of total Kjeldahl nitrogen, total organic carbon, phenols, arsenic, and mercury were observed above the clay but not below the clay. Chromium was observed at higher levels below the clay.

Samples collected by the DEC in December 1982 of the wells screened below the clay were analyzed for organic priority pollutants. None were detected.

Further analyses are required to determine the make up of the nitrogen compounds, which may be dye intermediates.

**B.1.1.3 Times Beach-Site 241 (915080)** - The Times Beach site is located adjacent to Lake Erie near the head of the Niagara River.

The Corps of Engineers used this 18.6 hectare (46 acre) site for disposal and containment of dredge spoils from the Buffalo River, Buffalo Harbor, and the Black Rock Canal from 1971-76. Approximately 420,500 cubic metres (550,000 cubic yards) of dredged material has been deposited at the site.

Recent studies indicate that the water level within the site fluctuates on a lag time basis with the lake level. The barrier itself does not appear to be preventing water from entering or leaving the containment site. Any leachate produced at the site would enter Lake Erie and the Niagara River.

The dredge spoils deposited in the containment area consist of sand, silt, and clay. The bedrock underlying the disposal site is Onondaga Limestone which is overlain by natural lake deposits of silt and clay.

In the summer of 1981, the Army Corps of Engineers collected 16 dredge spoil samples from the site. The samples were analyzed for a number of organic and inorganic constituents; the results appear below:

Concentration of Selected Inorganic and Organic Compounds  
in Spoils Samples at Times Beach Dredge Spoil Site<sup>2/</sup>

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Arsenic <sup>1/</sup>	58.9	22.7
Cadmium <sup>1/</sup>	13.3	11.9
Chromium <sup>1/</sup>	393	332
Copper <sup>1/</sup>	269	251
Lead <sup>1/</sup>	1,037	497
Mercury <sup>1/</sup>	9.4	4.8
Nickel <sup>1/</sup>	63	55
Zinc <sup>1/</sup>	1,854	1,283
Bis(2-ethylhexyl) phthalate <sup>1/</sup>	5.5	3.0
PCB (Aroclor 1242) <sup>1/</sup>	1.0	0.7
PCB (Aroclor 1254) <sup>1/</sup>	2.5	1.5
Aniline	2.8	2.3
1-Aminonaphthalene	4.1	2.7
N-Benzyl-ethylaniline	7.0	4.5
4,4'-Methylene-bis(N,N'-dimethylaniline)	1.4	0.9
p,p'-Benzylidene bis(N,N'-dimethylaniline)	4.7	3.3
Benzo(a)pyrene <sup>1/</sup>	96	39
1,2-Dichlorobenzene <sup>1/</sup>	9.8	3.5
1,3-Dichlorobenzene <sup>1/</sup>	9.5	3.9
1,4-Dichlorobenzene <sup>1/</sup>	22	12
Naphthalene <sup>1/</sup>	20	14
Phenanthrene <sup>1/</sup>	15	13
Anthracene <sup>1/</sup>	13	9.7

TABLE (continued)

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Fluoranthene <sup>1/</sup>	24	17
Pyrene <sup>1/</sup>	27	17
Benzo(a)anthracene <sup>1/</sup>	23	12
Chrysene <sup>1/</sup>	26	14

<sup>1/</sup> EPA priority pollutant<sup>2/</sup> HNO<sub>3</sub> extracted

Compounds identified but not quantified include 4-(dimethyl-amino) benzophenone, N,N,N',N'-tetramethylbenzidine, chlordane, toxaphene, dimethyl phthalate, diethyl phthalate, dibutyl phthalate, benzylbutyl phthalate, lindane, heptachlor, aldrin, p,p'-DDE, dieldrin, endrin, p,p'-DDD, p,p'-DDT, methoxychlor, mirex, and phenol.

Three monitoring wells were installed by the USGS in the containment site in 1982. In January 1983, the three monitoring wells installed at the site were sampled and a surface water sample was collected by the USGS. Each sample was analyzed for priority pollutants. The results of the analyses are as follows:

<u>Parameter</u>	<u>Concentration (ug/L)</u>		<u>Surface Water (Single Sample)</u>
	<u>Sub-surface Water Maximum</u>	<u>Mean</u>	
Aluminum	95,800	33,810	30,000
Antimony <sup>1/</sup>	24	8	31
Arsenic <sup>1/</sup>	106	67.3	115
Barium	2,320	929	331
Cadmium <sup>1/</sup>	17	10.2	39
Chromium <sup>1/</sup>	496	223	758
Cobalt	220	73.3	ND
Copper	1,250	472	912
Lead <sup>1/</sup>	3,560	1,331	2,020
Manganese	19,200	7,752	2,930
Mercury <sup>1/</sup>	0.96	0.32	ND
Nickel <sup>1/</sup>	659	219	129
Thallium <sup>1/</sup>	ND	ND	66
Zinc <sup>1/</sup>	761,000	261,000	3,340



TABLE (continued)

<u>Parameter</u>	<u>Concentration (ug/L)</u>		
	<u>Sub-surface water</u> <u>Maximum</u>	<u>Mean</u>	<u>Surface Water</u> <u>(Single Sample)</u>
Benzene 1/	370	149	ND
Chlorobenzene 1/	4,600	1,743	ND
Ethylbenzene 1/	46	29.7	ND
Toluene 1/	15	7.6	ND
2-Chlorophenol 1/	39	13	ND
1,2-Dichlorobenzene 1/	230	76.7	ND
1,3-Dichlorobenzene 1/	22	7.3	ND
1,4-Dichlorobenzene 1/	120	56.3	ND
1,2,4-Trichlorobenzene 1/	77	25.7	ND
N-nitrosodiphenylamine 1/	48	24	38
Bis(2-ethylhexyl) phthalate 1/	81	37	ND
Aniline	35	11.7	ND
4-Chloroaniline	430	143	ND
Naphthalene 1/	100	33.3	ND
o-Xylene	32	10.7	ND
Fluoranthene	ND	ND	9.2
Hexane	2,500	1,533	ND

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1/ EPA Priority pollutant

ND Not detected

Other organic parameters tentatively identified and semi-quantified include: methylcyclopentane, 4-ethyl-2-methylhexane, 4-methylbenzeneamine, 2-chlorobenzeneamine, 3-ethyl-5-methylpyridine, 2,4-dimethylheptane, 1,3-dimethylbenzene, 3-hexanone, 2-hexanone, 3-hexanol, 2-hexanol, and 1-hexanol.

Two other dredge spoil containment sites, the Small Boat Harbor containment site located in the Buffalo Outer Harbor and the Buffalo Harbor containment site located adjacent to the Bethlehem Steel Corporation plant along Lake Erie were sampled in a similar manner. The results of the sub-surface and surface water samples at these sites are as follows:

Parameter	Subsurface Water Mean Concentration (ug/L)		Surface Water Single Sample Concentration (ug/L)	
	Small Boat Harbor Site	Buffalo Outer Harbor Site	Small Boat Harbor Site	Buffalo Outer Harbor Site
Aluminum	3,690	5,030	234	1,680
Antimony <u>1/</u>	7	ND	ND	ND
Arsenic <u>1/</u>	44	17	ND	ND
Barium <u>1/</u>	186	233	ND	ND
Cadmium <u>1/</u>	9.8	6.2	ND	ND
Chromium <u>1/</u>	122.3	102	ND	19
Copper <u>1/</u>	94.3	20.7	ND	ND
Lead <u>1/</u>	357	124	ND	72
Manganese	3,426	5,110	39	311
Mercury <u>1/</u>	0.3	ND	ND	ND
Nickel <u>1/</u>	47.7	ND	ND	ND
Tin	16	25.3	ND	ND
Zinc <u>1/</u>	11,136	14,600	14	124
Benzene <u>1/</u>	21.7	255	ND	ND
Chlorobenzene <u>1/</u>	834	109	ND	ND
Toluene <u>1/</u>	ND	2.8	ND	ND
Ethylbenzene <u>1/</u>	3.7	ND	ND	ND
1,3-Dichlorobenzene <u>1/</u>	20.7	ND	ND	ND
N-nitrosodiphenylamine <u>1/</u>	23.7	ND	ND	ND
1,4-Dichlorobenzene <u>1/</u>	8.7	ND	ND	ND
Bis(2-ethylhexyl) phthalate <u>1/</u>	ND	20	ND	ND
Acenaphthylene	ND	7	ND	ND
Phenanthrene <u>1/</u>	ND	1.9	ND	ND
Naphthalene <u>1/</u>	ND	36.7	ND	ND
o-Xylene	6	1.9	ND	ND
Fluoranthene <u>1/</u>	ND	8	ND	ND

1/ EPA priority pollutant

ND Not detected

Additional parameters similar to those at the Times Beach site were tentatively identified at these containment sites.

Water level measurements illustrate the occurrence of water movement from the Times Beach site. Additional monitoring would be required to determine the rate of migration.

### B.1.2 Buffalo River Segment

#### B.1.2.1 Mobil Oil Corporation - Site 141 (915040) - The Mobil Oil

Corporation site is located in the southern part of the City of Buffalo adjacent to the Buffalo River at mile point 4.9.

The site was used to dispose of unknown quantities of non-contact cooling water silt, air flotation unit sediments, gravity separator sediments, tetraethyl lead, lube sludges, spent catalysts, and soil contaminated with asphalt and fuel oil.

It is expected that there is contaminant migration to the Buffalo River from the disposal site. The material underlying the disposal site is sand, which has a high permeability; thus, the groundwater may move freely toward the river.

A soil sample was collected by USGS in 1982 from each of four test borings. Each sample received lead analysis and a GC/MS acid-base natural scan for organic compounds. The results of the analyses indicate elevated levels of lead (920 ug/g maximum, 238 ug/g mean). No organic priority pollutants were quantified.

Analyses of four additional soil samples collected by USGS in May 1983 and analyzed for organic parameters are as follows:

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Methylene chloride 1/	0.7	0.2
Ethylbenzene 1/	0.09	0.02
Fluorotrichloromethane	0.04	0.01
Toluene 1/	0.01	0.01
Fluoranthene 1/	38	10
Benzo(a)anthracene 1/	15	4.1
Benzo(a)pyrene 1/	15	4.1
Benzo(k)fluoranthene 1/	15	3.7
Phenanthrene 1/	46	11.9
Pyrene 1/	31	7.9
Chrysene 1/	15	4.1

TABLE (continued)

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Acenaphthalene 1/	15	3.7
Anthracene 1/	11	2.7
Fluorene 1/	11	2.7
Benzo(k)fluoranthene 1/	600	150

1/ EPA priority pollutant

Organic compounds tentatively identified and semiquantified include: 2-methylbutane, cyclohexane, methylcyclohexane, 1,2-dimethyl-cis-cyclohexane, 3-hepten-2-one, 1-methylpyrene, and hydrocarbons.

B.1.2.2 McNaughton-Brooks, Incorporated - Site 138 (915034) - McNaughton-Brooks, Incorporated is located in the City of Buffalo near the Buffalo River at mile point 4.7.

Solvents such as xylol, toluol, and paint sludges were disposed on a rubble pile at the site until 1966.

The clay encountered inhibits vertical migration of contaminants. The concentration of synthetic organic compounds in the soil samples analyzed indicates that horizontal migration off the disposal site may have occurred.

A soil sample was collected by USGS in 1982 from each of four boreholes and analyzed for cadmium, chromium, lead, and a GC/MS acid-base neutral scan for organic compounds was performed. Lead was the only inorganic constituent identified at elevated levels. The maximum and mean values for lead and the organic priority pollutants quantified are as follows:

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Lead 1/	520	175
Naphthalene 1/	6	2
Acenaphthylene 1/	7	2
Acenaphthene 1/	20	8

TABLE (continued)

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Fluorene 1/	18	8
Phenanthrene 1/	59	23
Anthracene 1/	23	6
Fluoranthene 1/	104	35
Pyrene 1/	104	33
Chrysene 1/	84	21
Benzo(a)anthracene 1/	89	23
Benzo(b)fluoranthene 1/	5	1
Benzo(k)fluoranthene 1/	167	48
Benzo(a)pyrene 1/	85	22
Undecane	2	0.4

Organic compounds tentatively identified include: 1,4-dimethylbenzene, 1,2-dimethylbenzene, 2-methylnaphthalene, 1-methylnaphthalene, 1,1'-biphenyl, 1,5-dimethylnaphthalene, 2,3-dimethylnaphthalene, 4-methyldibenzofuran, and (1,1'-biphenyl)-4-carboxaldehyde.

Organic parameters analyses of four additional soil samples collected by USGS in May 1983 are as follows.

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Benzene 1/	0.03	0.02
Ethylbenzene 1/	0.1	0.6
Methylene chloride 1/	0.2	0.07
Toluene 1/	0.09	0.02
Fluoranthene 1/	34.2	11.8
Naphthalene 1/	11.2	2.8
Bis(2-ethylhexyl) phthalate 1/	0.1	0.03
Benzo(a)anthracene 1/	25.2	6.3
Benzo(a)pyrene 1/	0.02	.005
Benzo(b)fluoranthene and benzo(k)fluoranthene 1/	32.4	8.1
Chrysene 1/	25.7	6.4
Pyrene 1/	60.5	17.8
Acetone	0.5	0.1
2-Butanone	0.09	0.02
Carbon disulfide	0.007	0.002
4-Methyl-2-pentanone	0.2	0.05

TABLE (continued)

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Styrene	0.01	0.003
o-Xylene	0.6	0.3

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1/ EPA priority pollutant

Additional parameters tentatively identified and semi-quantified are: 1,7,7-trimethyl-tricyclo (2.2.1.02,6) heptane, 1-ethyl-2-methyl-benzene, tetrahydrofuran, 3-methyl-2-butanone, 1-pentanol, 2,6,6-trimethyl-bicyclo (3.1.1) hepten-2-one, 1,3- and 1,4-dimethylbenzene, benzofuran, cis-1,2-dimethylcyclohexane, 5-methyl-1-phenyl-hexane, 2-propyloxybenzene, 1,3,5-trimethylbenzene, 1,2,3-trimethylbenzene, and hydrocarbons. The presence of these volatile hydrocarbons suggests a significant potential for contaminant migration.

**B.1.2.3 Allied Chemical - Site 107 (915004)** - The Allied Chemical site is located in the southern part of the City of Buffalo and is adjacent to the Buffalo River at mile point 4.5.

The site had a sludge lagoon in which an unknown quantity of spent vanadium pentoxide catalyst, sulfate sludges, sulfuric acid, nitric acid, salts, slag, and polymerized "sulphan" were deposited. The lagoon operated between 1930 and 1977. Since then, it has been excavated and filled with clean fill.

No geologic data were obtained for this site. Three monitoring wells were drilled by the owner between the disposal site and the Buffalo River. No drilling logs were available.

Three monitoring wells were sampled by the USGS in July 1982. Each water sample was analyzed for chromium, copper, lead, nickel, and vanadium. The results shown below indicate elevated levels of lead and nickel.

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Copper <u>1/</u>	190	84
Lead <u>1/</u>	370	173
Nickel <u>1/</u>	900	373
Vanadium	30	13

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1/ EPA priority pollutant

Analyses indicate low values for pH (3.9 maximum, 3.6 mean). These pH values would enhance mobilization and seepage of inorganic contaminants to the river.

**B.1.2.4 Buffalo Color Corporation - Sites 120-122 (915012-a, b, c)** - The Buffalo Color Corporation is located in the southern part of the City of Buffalo and is adjacent to the Buffalo River at mile point 4.1.

Three disposal sites have been identified on the property:

- . two lagoons for iron oxide sludge which were used from 1930-1963.
- . a weathering area which may contain traces of organics in metal sludge; and
- . a 774-foot well used to dispose of 3.5 million gallons of 40 percent ammonium sulfate from 1957-1963.

The geology of the site consists of 2.1 to 6.1 metres (7 to 20 feet) of fill. The site is underlain with Onondaga Limestone. The deep well extends to the bottom of the Lockport Dolomite or uppermost portions of the Rochester Shale. A 61-metre (200-foot) steel casing extends from the surface through the Camillus Shale.

Two composite soil samples collected in December 1982 by the owner indicated the following compounds in the weathering area at the concentrations shown:

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Arsenic <sup>1/</sup>	1,870	989
Chromium, total <sup>1/</sup>	1,050	904
Chromium, hexavalent	3.2	1.9
Copper <sup>1/</sup>	6,200	5,905
Lead <sup>1/</sup>	57,600	41,900
Mercury <sup>1/</sup>	138	89
Nickel <sup>1/</sup>	103	82
Zinc <sup>1/</sup>	2,130	1,462
1-Naphthylamine	0.2	0.2
Benzidine <sup>1/</sup>	1.0	1.0
Acenaphthene <sup>1/</sup>	1.0	1.0
Naphthalene <sup>1/</sup>	2.0	1.5
Fluorene <sup>1/</sup>	1.9	1.5
Anthracene <sup>1/</sup> // Phenanthrene <sup>1/</sup>	9.6	5.2
Fluoranthene <sup>1/</sup>	10	6
Pyrene <sup>1/</sup>	6.7	3.8
Chrysene <sup>1/</sup> // Benzo(a)anthracene <sup>1/</sup>	4.6	2.8
Benzo(b)fluoranthene, <sup>1/</sup> // benzo(k)fluoranthene, <sup>1/</sup> // benzo(a)pyrene <sup>1/</sup>	7.9	4.8
Dinitrotoluene <sup>1/</sup>	1,000	500

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<sup>1/</sup> EPA priority pollutant

Soil samples obtained below the two closed lagoons indicated the presences of similar compounds.

A detailed site investigation program is currently underway at this facility.

The proximity of these sites to the river and the concentrations of organic and inorganic compounds indicate a significant potential for contaminant movement to the river.

### B.1.3 Black Rock Canal Segment

No significant disposal sites are located along this segment with the exception of Squaw Island, which is presented in the Bird Island - Riverside segment.



#### B.1.4 Bird Island - Riverside Segment

B.1.4.1 Squaw Island - Site 203 (915052) - Squaw Island is located between the Niagara River and the Black Rock Canal which separates the island from the mainland of the City of Buffalo. The disposal site is located at mile point 33.8 on the Niagara River.

The site has accepted foundry sand with phenolic binders, incinerator residue, street sweepings, debris, and general refuse for over three decades. From 1954-70, the island was used for the disposal of waste foundry sand consisting of insoluble metal compounds, trace oils, and resins. It is estimated that the rate of disposal was 300,000 to 400,000 tons/year. In the mid-1970's, much of the fill was excavated and transferred to the Tifft site to allow for the construction of the Buffalo Sewer Authority Wastewater Treatment Plant.

The geology of the site consists of a thin mantle of till and unsorted sediments overlying limestone bedrock.

A soil sample was collected by USGS in 1982 from each of eight test borings and analyzed for chromium and copper. A GC/MS acid base neutral scan for organic compounds was performed. The results of the analyses indicate elevated levels of chromium and copper. The concentrations for the parameters are as follows:

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Chromium <u>1/</u>	20	9
Copper <u>1/</u>	1,700	398
1,2,3-Trimethylbenzene	0.4	0.05
Fluoranthene <u>1/</u>	0.3	0.04
Pyrene <u>1/</u>	0.7	0.09

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1/ EPA priority pollutant

Other organic compounds tentatively identified and semi-quantified include: 1,1-ethanediol diacetate, 4-methyl-2-pentanone, 2-butanone, 2-

methylheptane, 2,3,4-trimethylhexane, 2,6-dimethylheptane, 1,3,5-cycloheptatriene, 3-methylheptane, 2,2'-methylene-bis(oxy)bispropane, 2-methyl-2-propyl-1,3-dioxylene, 2-methyl-2-hexanol, 2,3,3,4-tetramethyl pentane, 1,2-dimethylbenzene, propylbenzene, 1-ethyl-2-methylbenzene, 3-ethylhexane, 2,2,3-trimethylbutane, 2,4,4-trimethylhexane, 2-cyclohexen-1-one, 3-methyl-2-pentanone, 5-methylnonane, 2,2,5-trimethyl-3,4-hexanedione and 2h-pyran-2-one.

Analyses from two additional soil samples collected by USGS in May 1983 and analyzed for organic constituents are below:

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Benzene 1/	0.006	0.003
Fluoranthene 1/	0.1	0.09
Bis(2-ethylhexyl) phthalate 1/	0.01	0.006
Benzo(a)anthracene 1/	0.07	0.06
Benzo(a)pyrene 1/	0.04	0.03
Benzo(b)fluoranthene and benzo(k)fluoranthene 1/	0.1	0.09
Chrysene 1/	0.06	0.05
Acenaphthalene 1/	0.01	0.005
Fluorene 1/	0.01	0.005
Phenanthrene 1/	0.01	0.005
Indeno(1,2,3-cd)pyrene	0.03	0.03
Pyrene 1/	0.1	0.09
4-Methylphenol	0.005	0.002

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1/ EPA priority pollutant

Other organic compounds tentatively identified and semiquantified in this sampling were: 3,4-dihydro-2,5,7,8-tetramethyl-2-(4,18,12-trimethyl)-2H-1-benzopyrene-1-01 and hydrocarbons.

The location of the site between the Niagara River and the Black Rock Canal would allow any leachate to percolate to these water bodies.

## B.2 Tonawanda-North Tonawanda Sub-area

B.2.1 Allied Chemical, Tonawanda - Site 105 (915003-b) - The Allied Chemical site is located in the Town of Tonawanda and is within 610 metres (2,000 feet) of the Niagara River at mile point 29.8.

The site was used from 1950 to 1960 to dispose of an unknown quantity of scrap chlorinated and non-chlorinated polyethylene and spent catalyst.

The geology of the site consists of a lacustrine clay deposit overlying a bedrock of Camillus Shale.

Four soil samples were collected by the USGS in 1982. Each sample was analyzed for arsenic, cadmium, chromium, lead, mercury, and nickel. The results indicate elevated levels of chromium (90 ug/g maximum, 44 ug/g mean), lead (200 ug/g maximum, 100 ug/g mean), and nickel (120 ug/g maximum, 55 ug/g mean).

The site was resampled by USGS in May 1983. The results of the analyses of four soil samples for organic compounds are as follows:

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Benzene 1/	0.006	0.001
Tetrachloroethene 1/	0.009	0.002
Fluoranthene 1/	0.04	0.01
Naphthalene 1/	0.01	0.004
Bis(2-ethylhexyl) phthalate 1/	1.3	0.3
Benzo(a)anthracene 1/	0.02	0.006
Benzo(a)pyrene	0.02	0.006
Benzo(b)fluoranthene and benzo(k)fluoranthene 1/	0.03	0.008
Chrysene	0.02	0.006
Phenanthrene 1/	0.03	0.01
Pyrene 1/	0.03	0.01
Carbon disulfide	0.02	0.006
o-Xylene	0.003	0.001

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1/ EPA priority pollutant

Other organic compounds tentatively identified and semi-quantified include: 2-chloro-transcyclohexanol, 9-methylphenanthrene, 3-methylphenanthrene, 4-h-cyclopenta(def)phenanthrene, 2-methylphenanthrene, 1-methylpyrene, and perylene.

Additional information is needed to confirm contaminant migration from this site.

B.2.2 Tonawanda Coke - Site 108 (915055-a) - The Tonawanda Coke site is located adjacent to the Niagara River in the Town of Tonawanda at mile point 29.8.

The site was used for general landfilling of fly ash, cinders, and tar sludges disposed at the rate of 4,680 tons per year during the period 1930-79.

The geology of the site consists of fill overlying a glacial lacustrine clay which is underlain by a bedrock of Camillus Shale.

One groundwater and two soil samples were collected at the site by the USGS. One surface water sample was collected from a drainage ditch. Each sample was analyzed for cyanide plus organic compounds using a GC/MS acid-base neutral scan.

While an upgradient water sample indicated that cyanide (280 ug/L) was slightly elevated, the downgradient soil samples (water not encountered in the borings) did not indicate the presence of cyanide.

Analyses from resampling conducted by the USGS of two soil samples in May 1983 for organic compounds are as follows:

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Benzene <u>1/</u>	0.1	0.08
1,2-Trans-dichloroethene	0.4	0.2
Ethylbenzene <u>1/</u>	0.1	0.8
Methylene chloride <u>1/</u>	0.04	0.02
Tetrachloroethene	0.03	0.01
Toluene <u>1/</u>	0.3	0.1
Vinyl chloride <u>1/</u>	2.1	1.0
Naphthalene <u>1/</u>	0.02	0.01

TABLE (continued)

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Bis(2-ethylhexyl) phthalate <u>1/</u>	0.06	0.03
Acetone	0.3	0.1
Carbon disulfide	0.2	0.1
o-Xylene	0.5	0.3

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1/ EPA priority pollutant

Other organic compounds tentatively identified and semi-quantified include: 2,3-dihydro-1H-indene, 1H-indene, cyclohexane, methylcyclopentane, 1,1,3-trimethyl-cyclohexane, 2,2,3,4-tetramethylpentane, 1-ethyl-3-methyl-transcyclopentane, 2,6,6-trimethyl-bicyclo (3.1.1)-hepten-2-one, and hydrocarbons.

Additional information is needed to confirm contaminant migration from this site.

B.2.3 INS Equipment Corporation - Site 136 (915031) - The INS Equipment Corporation site is located in the Town of Tonawanda and is adjacent to the Niagara River at mile point 29.1.

The 22.3-hectare (55-acre) site was used to dispose of an unknown quantity of pit sludge, cutting oils, grinding waste, and foundry sand. The site has been covered, graded, and seeded.

The location of the site with respect to the river, the probable direction of groundwater flow, and a history of past wetlands with a hydrologic connection to the river, all lead to the conclusion that migration can be expected to be taking place.

Prior to filling, the site consisted of wetlands over glacial lacustrine deposits. The bedrock underlying the site is Camillus Shale.

A soil sample was collected by the USGS at each of ten boreholes. Each sample was analyzed for cadmium, chromium, lead, and organic compounds using a GC/MS acid-base neutral scan.

Elevated levels of cadmium, chromium, and lead were quantified as indicated in the following listing. Organic compounds including a number of priority pollutants were also quantified.

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Cadmium <u>1/</u>	53	9.5
Chromium <u>1/</u>	430	101
Lead <u>1/</u>	2,500	383
Octadecane	550	86
Phenol <u>1/</u>	61	6.1
2-Methylphenol	11	1.1
4-Methylphenol	43	4.3
Acenaphthylene <u>1/</u>	21	2.1
Fluorene <u>1/</u>	13	1.3
Phenanthrene <u>1/</u>	70	14.4
Anthracene <u>1/</u>	26	2.6
Fluoranthene <u>1/</u>	150	17.5
Pyrene <u>1/</u>	88	12.3
Di-n-butyl phthalate <u>1/</u>	11	1.1
Benzo(a)anthracene <u>1/</u>	52	10.4
Chrysene <u>1/</u>	35	3.5
Dibenzofuran	12	1.2
Benzo(a)pyrene <u>1/</u>	23	2.3
Benzo(b)fluoranthene <u>1/</u>	33	3.3
Benzo(k)fluoranthene <u>1/</u>	33	3.3

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1/ EPA priority pollutant

In addition, the following organic compounds were identified and semi-quantified: 2,4-dimethyl-1,3-dioxolene, 1,3-dimethylbenzene, decane, undecane, tridecane, tetradecane, hexadecane, heptadecane, eicosane, hexeicosane, 2,6,10,14-tetramethylheptadecane, 4-methyldecane, dodecane, 2,6,11-trimethyldodecane, pentadecane, 2-methylpentadecane, 1,5-hexadiene, cyclohexane, 3-hexen-2-one, 4-methylphenanthrene, 2-phenylnaphthalene, 1-methylpyrene, 7-h-benzo(de)anthracene-7-one, benzo(k)phenanthrene, and perylene.

The proximity of the site to the river and the former presence of wetlands suggest that migration could be occurring.

**B.2.4 Huntley Power Station - Site 182 (915063)** - The Huntley Power Station site is located in the Town of Tonawanda and is adjacent to the Niagara River at mile point 28.7.

The site was used by Occidental Chemical (Durez Division) for the disposal of approximately 625 tons of phenol tars, some of which contained varying amounts of chlorinated benzenes. An unknown amount of foundry sand and slag was disposed at the site.

The geology of the unconsolidated deposits consists of glacial lacustrine deposits of sand, silt, and clay. These deposits overlie a bedrock of Camillus Shale.

A soil sample was collected by USGS in 1982 at each of thirteen boreholes and analyzed for arsenic, cadmium, chromium, lead, mercury, and nickel. Two additional surface water samples and five drainage ditch samples were also collected and analyzed for the same parameters. A positive organic vapor metre reading was noted during the soil sampling.

The metals analyses of both the soil samples from the boreholes and drainage ditches plus the surface water samples are as follows:

<u>Parameter</u>	<u>Soil Samples (ug/g)</u>				<u>Surface Water Samples (ug/L)</u>	
	<u>Borings</u> <u>Maximum</u>	<u>Mean</u>	<u>Drainage</u> <u>Maximum</u>	<u>Ditch</u> <u>Mean</u>	<u>Maximum</u>	<u>Mean</u>
Arsenic <sup>1/</sup>	1	0.1	ND	ND	5	4
Cadmium <sup>1/</sup>	3	0.9	1	0.4	1	1
Chromium <sup>1/</sup>	ND	ND	ND	ND	ND	ND
Lead <sup>1/</sup>	120	33	30	22	57	33
Mercury <sup>1/</sup>	ND	ND	ND	ND	ND	ND
Nickel <sup>1/</sup>	20	10	10	6	9	7

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<sup>1/</sup> EPA priority pollutant  
ND Not detected

Analyses of soils from resampling by the USGS in May 1983 for organic compounds are as follows:

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Methylene chloride 1/	0.8	0.2
Toluene 1/	0.05	0.01
Trans-1,2-dichloroethene	0.047	0.007
Trichloroethene	0.059	0.009
PCB-1248 1/	199	16.2
Heptachlor epoxide 1/	0.035	0.005
Phenol 1/	35	2.7
Fluoranthene 1/	0.2	0.01
Naphthalene 1/	5.6	0.4
2,4-Dimethylphenol 1/	0.5	0.08
Bis(2-ethylhexyl) phthalate 1/	9.4	0.5
Acenaphthene 1/	0.2	0.04
Fluorene 1/	0.2	0.03
Phenanthrene 1/	4.7	0.2
Benzene 1/	0.01	0.003
Ethylbenzene 1/	0.1	0.02
Diethyl phthalate 1/	4.7	0.9
Carbon disulfide	0.01	0.003
PCB-1260 1/	0.5	0.1
beta-BHC	10	2
Acetone	0.8	0.1
2-Methylnaphthalene	5.6	0.9
4-Methylphenol	11	1.7
Dibenzofuran	0.3	0.03
o-Xylene	0.5	0.05
2-Methylphenol	3.6	0.7
2,6-Dimethylundecane	1.1	0.2
2,3,7-Trimethyloctane	1.2	0.2
Hexadecanoic acid	1	0.2

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1/ EPA priority pollutant

Additional parameters tentatively identified and semiquantified include: tetrachloro-1,1'-biphenyl, terphenyl, 1,2,3-trimethylbenzene, 1,2-dimethylnaphthalene, 2-(1-methylethyl)phenol, 1,2-benzenedicarboxylic acid, hexadecane, heptadecane, undecane, dodecane, tridecane, tetradecane, 2,6-dimethylundecane, 2,3,7-trimethyloctane, 1,3,5-trimethylbenzene, 1,4-dimethyl-2-ethylbenzene, 2-(1-methylethyl)benzene, 7-methyltridecane, 4-fluoro-1,1'-biphenyl, 2-methylundecane, 5-propyltridecane, 1-ethyl-2-methylbenzene, 2-ethyl-1,4-dimethylbenzene, 1,8-dimethylnaphthalene, 1,6,7-trimethylnaphtha-



lene, decane, octadecane, 2,6,10,14-tetramethylheptadecane, hexane, and hydrocarbons.

**B.2.5 Columbus McKinnon Corporation - Site 123 (915016)** - The Columbus McKinnon Corporation site is located in the City of Tonawanda and is adjacent to Ellicott Creek at mile point 0.8. Ellicott Creek is a tributary of Tonawanda Creek which enters the Niagara River at mile point 25.2.

The site was used to dispose of 102,200 liters (27,000 gallons) of water-soluble waste cutting oils in an open pit 37 metres (400 feet) square adjacent to Ellicott Creek. The pit operated from 1930 to 1965. The area has since been covered with soil and graded.

The geology of the site is fill overlying silt and fine sand. The underlying bedrock is believed to be Camillus Shale.

Soil samples were collected by the owner in 1981 at eight boreholes in the unconsolidated deposits. Each soil sample was analyzed for total PCBs and total halogenated organics. The results of the analyses indicate total PCBs at 549 ug/g maximum, 78 ug/g mean and total halogenated organics at 19 ug/g maximum, 7 ug/g mean. Further remedial investigation is currently underway.

**B.2.6 Occidental Chemical (Durez Division) - Sites 24-37 (932018 & 932095)** - The Occidental Chemical (Durez Division) plant site is located in the City of North Tonawanda and is 2.7 kilometres (1.7 miles) from the Niagara River at mile point 24.1.

The plant site has 14 separate disposal sites operated by the company between 1930 and 1973. Two of the sites have been clay capped and are being monitored. 250 tons of phenol tar (some may contain chlorobenzenes), 28,000 tons of phenol-bearing material, and 250 tons of calcium-aluminum oxide and calcium phosphate were disposed at the plant site.

The geology of the site consists of fill overlying glaciolacustrine silt, fluvial sands and gravel, and glaciolacustrine clay. These units may be underlain in places by till, and overlie a bedrock composed of Camillus Shale.

There is a very high potential for contaminants to migrate within the more permeable fill and fluvial sands and gravels.

Thirty monitoring wells were installed in the unconsolidated deposits and sampled in 1980 for organic compounds by the owner. The results of the analyses are as follows:

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Total phenolics	190,000	12,400
Toluene <sup>1/</sup>	3,300	200
Monochlorobenzene <sup>1/</sup>	1,400,000	33,800
1,2-Dichlorobenzene <sup>1/</sup>	3,200	380
1,3-Dichlorobenzene <sup>1/</sup>	2,000	130
1,4-Dichlorobenzene <sup>1/</sup>	5,500	440
1,2,3-Trichlorobenzene	370	13
1,2,4-Trichlorobenzene <sup>1/</sup>	1,100	61
1,3,5-Trichlorobenzene	46	2

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<sup>1/</sup> EPA priority pollutant

The analyses from these wells indicate a substantial amount of contamination within the unconsolidated deposits.

While site investigation activities were underway, total dioxins were detected by the owner in April 1982 at a mean level of 87 picograms per gram (parts per trillion) in residues on the site. However, the isomer 2,3,7,8-dioxin has not been detected in the groundwater.

This site is currently under state litigation. Investigative activities are continuing by the owner.

B.2.7 Gratwick-Riverside Park - Site 68 (932060) - Gratwick-Riverside Park is located in the City of North Tonawanda and is adjacent to the Niagara River at mile point 22.9.

The site was used by Occidental Chemical (Durez Division) and Bell Aerospace for the disposal of 25,000 tons of phenolic resin, 25,000 tons of phenolic molding compounds, 50 tons of oil and grease, and 50,000 tons of domestic refuse.

Contaminant migration would be expected from this site. The fill is fairly permeable, enabling groundwater to move freely toward the Niagara River. Downward movement of contaminants through the clay unit is unlikely because of its very low permeability.

The geology of the site consists of fill overlying a Holocene lacustrine clay which overlies a bedrock of Camillus Shale. The depth to bedrock is approximately 7.6 metres (25 feet).

In 1982, the USGS installed a monitoring well and collected a sample along with a sample from each of four existing wells. The samples were analyzed for arsenic, cadmium, chromium, copper, lead, mercury, and nickel as well as for organic compounds using a GC/MS acid-base neutral scan.

Elevated levels of lead and nickel were quantified as indicated in the following listing. Organic compounds including a number of priority pollutants were also quantified.

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Lead <sup>1/</sup>	150	99
Nickel <sup>1/</sup>	20	7
Phenol <sup>1/</sup>	1,914	405
Naphthalene <sup>1/</sup>	50	10
Butylbenzyl phthalate <sup>1/</sup>	21	4
2-Ethylhexyl phthalate	8	2
2,4-Dimethylphenol <sup>1/</sup>	5	1
m-Cresol	370	113
p-Cresol	18	4

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<sup>1/</sup> EPA priority pollutant

Other organic compounds tentatively identified and semi-quantified include: 1-2-butoxyethoxyethanol, (1-1'-biphenyl)-2-ol, (1-1'-biphenyl)-3-ol, (1-1'-biphenyl)-4-ol, 2-dibenzofuranol, 3-(1,1-dimethylethyl)-phenol, 2-butoxyethylbutyl phthalate, 1-1'-oxybisbenzene, 3,8-dimethylundecane, dibenzofuran, (1,1'-biphenyl)2-ol, 2-phenoxyphenol, 3-ethyl-3-methylhexane, 4-phenoxyphenol, 4-(1,1-dimethylethyl)phenol, ethylbenzene, 1,2,3-trimethylbenzene, and 3,4-dimethylphenol.

### B.3 Niagara Falls, New York Sub-area

#### B.3.1 Wheatfield-Upper River Segment

B.3.1.1 Niagara County Refuse Disposal - Site 81 (932026) - This site is located in the Town of Wheatfield and is within 244 metres (800 feet) of the Niagara River at mile point 22.5.

From 1968 to 1976, thousands of tons of heat treatment salts, plating tank sludge, PVC skins and emulsion, thiazole polymer blends, polyvinyl alcohol, phenolic resins, and brine sludge with mercury were disposed at the site. It had been reported that in 1968 the site received some excavated material from Love Canal. More recent information indicates that this excavated material was disposed at another site. Site 81 is on the National Priorities list for superfund investigation.

The geology of the site consists of lacustrine clay deposits containing thin sand stringers overlying a bedrock of Camillus Shale.

There is a seasonal water table perched upon the clay unit, discharging into the bordering drainage ditches and the swampy area to the east. The sand stringers are easily dewatered. There is also a saturated zone near the base of the clay unit which may represent a regional water table. The groundwater flow direction in this zone is toward the river.

Twelve samples were collected by USGS at the site: 2 water samples and 10 soil samples. Each sample was analyzed for organic compounds using a GC/MS acid-base neutral scan.

No organic compounds were quantified in two groundwater samples at the perimeter of the site. Four compounds were tentatively identified and semi-quantified: n-butylbenzene sulfonamide, 3,5-dimethoxy-alpha-(2-methyl-propyl)benzenemethanol, (1,1'-biphenyl)-2-ol, and 1-(2-butoxyethoxy)ethanol.

No organic compounds were quantified in the soil samples at the site. The organic compounds in the perimeter soil samples which were tentatively identified and semiquantified were: bromocyclohexane, 2-(1,1-dimethylethyl)-4-methylfuran, 1-(4-fluorophenyl)-ethanone, 6-methyl-3,5-heptadien-2-one, 3,5,5-trimethyl-2-cyclohexan-1-one, 2-bromoethyl cyclohexane, and 2-(2-butyl-oxyethoxy)ethanol.

In September 1980, EPA collected five sediment and two water samples from drainage ditches at the site. In June 1981 DEC collected four sediment samples and four water samples from the drainage ditches. The results of the priority pollutant analyses for these samples are summarized as follows:

Parameter	Drainage Ditch			
	Water Samples (ug/L)		Sediment Samples (ug/g)	
	Maximum	Mean	Maximum	Mean
Phenol <sup>1/</sup>	34,000	5,666	1.9	0.33
Acenaphthene <sup>1/</sup>			0.017	0.004
Acenaphthylene <sup>1/</sup>			0.13	0.014
Anthracene <sup>1/</sup>			2.0	0.273
Benzo(a)pyrene <sup>1/</sup>			2.3	0.299
Benzo(k)fluoranthene <sup>1/</sup>			2.2	0.282
Benzo(g,h,i)perylene <sup>1/</sup>			7.605	0.845
Bis(2-ethylhexyl) phthalate <sup>1/</sup>	330	57	6.9	2.444
Butylbenzyl phthalate <sup>1/</sup>	0.8	0.1	0.33	0.064
Chrysene <sup>1/</sup>			3.2	0.356
1,2-Dichlorobenzene <sup>1/</sup>			0.039	0.008
1,3-Dichlorobenzene <sup>1/</sup>			0.059	0.017
1,4-Dichlorobenzene <sup>1/</sup>			0.059	0.017
Diethyl phthalate <sup>1/</sup>	40	7	0.18	0.67
Di-n-butyl phthalate <sup>1/</sup>	9	2	0.47	0.217
Di-n-octyl phthalate <sup>1/</sup>	10	2	0.17	0.019
Fluoranthene <sup>1/</sup>			2.5	0.319
Fluorene <sup>1/</sup>			0.093	0.015
Hexachlorobenzene <sup>1/</sup>			0.039	0.004
Naphthalene <sup>1/</sup>			0.16	0.034
Phenanthrene <sup>1/</sup>			2.0	0.273

TABLE (continued)

Parameter	Drainage Ditch			
	Water Samples (ug/L)		Sediment Samples (ug/g)	
	Maximum	Mean	Maximum	Mean
Pyrene <sup>1/</sup>			2.0	0.254
1,2,4-Trichlorobenzene <sup>1/</sup>			0.047	0.006
Benzene <sup>1/</sup>			0.0005	0.0002
Chlorobenzene <sup>1/</sup>			0.005	0.001
Chloroform <sup>1/</sup>			0.004	0.002
1,2-Dichloroethane <sup>1/</sup>			0.004	0.001
Trans-1,2-dichloroethylene <sup>1/</sup>	37	7	0.012	0.002
1,2-Dichloropropane <sup>1/</sup>			0.001	0.002
Ethylbenzene <sup>1/</sup>	8	2	0.003	0.001
Benzo(a)anthracene <sup>1/</sup>			3.2	0.356
Indeno(1,2,3-cd)pyrene <sup>1/</sup>			0.82	0.091
2,4-Dimethylphenol <sup>1/</sup>			0.99	0.11
Methylene chloride <sup>1/</sup>	2	1	0.031	0.015
Tetrachloroethylene <sup>1/</sup>	56	11	0.019	0.004
Toluene <sup>1/</sup>	31	6	0.004	0.001
1,1,1-Trichloroethane <sup>1/</sup>			0.0005	0.0001
Trichloroethylene <sup>1/</sup>	8	2	0.005	0.002
Trichlorofluoromethane <sup>1/</sup>			0.001	0.002
Vinyl chloride <sup>1/</sup>	2	0.4		
Beta-BHC <sup>1/</sup>			0.058	0.006
Delta-BHC <sup>1/</sup>			0.09	0.010
4,4'-DDE <sup>1/</sup>			0.011	0.003
Heptachlor <sup>1/</sup>	0.13	0.04		
PCB-1248 <sup>1/</sup>			0.32	0.053
PCB-1254 <sup>1/</sup>			0.18	0.037
Arsenic <sup>1/</sup>	30	5	7.8	6.3
Copper <sup>1/</sup>	52	20	61	34
Lead <sup>1/</sup>	160	32	84	47
Mercury <sup>1/</sup>	1.58	0.4	14.2	3.2
Nickel <sup>1/</sup>	100	20	45	16.4
Silver <sup>1/</sup>			0.4	0.24
Beryllium <sup>1/</sup>			16	10.6
Cadmium <sup>1/</sup>			3.8	0.8
Chromium <sup>1/</sup>			23	14.1
Antimony <sup>1/</sup>			4	2.6
Selenium <sup>1/</sup>			0.2	0.06
Zinc <sup>1/</sup>	174	61	1500	390

<sup>1/</sup>EPA priority pollutant

Additional sampling is required to confirm the extent of contaminant migration from this site.

B.3.1.2 Olin (102nd Street) - Site 56 (932031) - This landfill is located in the City of Niagara Falls and is adjacent to the Niagara River at mile point 20.6.

The landfill was used from 1948 to 1970 for the disposal of chemical wastes from Olin's Niagara Falls plant. Over 80,000 tons of waste were disposed at the site. A listing of the types and quantities of waste disposed is as follows:

<u>Type of Waste</u>	<u>Quantity (tons)</u>
"Black Cake"	20,000
Graphite	742
Hexachlorocyclohexane (BHC) and trichlorophenol mixture	60
Trichlorobenzene	150
Alpha and Beta BHC cake	1,200
Tetrachlorobenzene	1,100
Lime sludge	23,900
Brine sludge	20,000
Hexachlorobenzene	60
Trichloroanisole	Unknown
Concrete	6,625

The geology of the site consists of deposits of fill and alluvial river sediments underlain by Pleistocene lacustrine clay and glacial till. These unconsolidated deposits are underlain by a bedrock of Lockport Dolomite.

A recent (1979) study of the site indicated that a plume of contaminated groundwater has intruded the alluvial deposits of the Niagara River beneath the landfill and is discharging into the Niagara River.

The site is currently under State and Federal litigation. Chemical data are not available during litigation.

B.3.1.3 Occidental Chemical (Love Canal) - Site 38 (932020) - This site is located in the City of Niagara Falls and is located within 400 metres (1,300 feet) of the Niagara River at mile point 20.4.

The site, 6.5 hectares (16 acres) in size, was used to dispose of industrial toxic materials and municipal waste. From 1942 to 1953, the Occidental Chemical Company disposed of 21,800 tons of toxic waste into the canal. The type and estimated quantity of waste disposed at the site is as follows:

<u>Type of Waste</u>	<u>Quantity (tons)</u>
Miscellaneous acid chlorides other than benzoyl - includes acetyl, capryl, butyryl and nitro benzoyls	400
Thionyl chloride and miscellaneous sulfur/chlorine compounds	500
Miscellaneous chlorinations - includes waxes, oils, naphthalene, aniline	1,000
Dodecyl (lauryl, lorol) mercaptans (dodecyl mercaptan), chlorides and miscellaneous organic sulfur compounds	2,400
Trichlorophenol (TCP)	200
Benzoyl chlorides and benzotrichlorides	800
Metal chlorides	400
Liquid disulfides (LDS/LDSN/BDS)	700
Hexachlorocyclohexane (Gamma-BHC/Lindane)	6,900
Chlorobenzenes	2,000
Benzyl chlorides - includes benzyl chloride, benzyl alcohol and benzyl thiocyanate	2,400
Sodium sulfide/sulphydrates	2,000
Miscellaneous - 10 percent of above	<u>2,000</u>
	21,700

The geology of the site and adjacent areas consists of fill and glacial unconsolidated deposits of lacustrine clays and till. These deposits are underlain by Silurian bedrock of Lockport Dolomite and Rochester Shale.



Chemical data from Well No. 77A located in the southwest portion of the site were used to characterize the contaminants observed at the periphery of the site. Data from Well No. 77A was reported in "Environmental Monitoring at Love Canal", EPA, 1982, as follows:

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
1,1-Dichloroethylene <sup>1/</sup>	1	0.5
Trans-1,2-dichloroethylene <sup>1/</sup>	14	8
Chloroform <sup>1/</sup>	80	62
Benzene <sup>1/</sup>	500	430
1,1,2,2-Tetrachloroethane <sup>1/</sup>	500	267
Tetrachloroethylene <sup>1/</sup>	320	186
Toluene <sup>1/</sup>	500	475
3-Chlorotoluene	500	250
4-Chlorotoluene	500	328
Chlorobenzene <sup>1/</sup>	500	371
Ethylbenzene <sup>1/</sup>	11	6
1,1,1-Trichloroethane <sup>1/</sup>	Trace	Trace
Trichloroethylene <sup>1/</sup>	157	79
1,1,2-Trichloroethane <sup>1/</sup>	11	6
m-Xylene	2	1
p plus o-Xylene	1	0.5
2-Chlorophenol <sup>1/</sup>	Trace	Trace
4-Chlorophenol	Trace	Trace
Phenol <sup>1/</sup>	3	3
2,4-Dichlorophenol <sup>1/</sup>	507	507
2,4,6-Trichlorophenol <sup>1/</sup>	734	734
1,4-Dichlorobenzene <sup>1/</sup>	190	190
1,2-Dichlorobenzene <sup>1/</sup>	130	130
1,2,4-Trichlorobenzene <sup>1/</sup>	Trace	Trace
1,3,5-Trichlorobenzene	Trace	Trace
Naphthalene <sup>1/</sup>	Trace	Trace
Diethyl phthalate <sup>1/</sup>	Trace	Trace
2,4,6-Trichloroaniline	Trace	Trace
1,2,3,4-Tetrachlorobenzene	Trace	Trace
Alpha-BHC <sup>1/</sup>	5	5
Gamma-BHC <sup>1/</sup>	17	17
2-Chlorotoluene	304	152

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<sup>1/</sup> EPA priority pollutant

The 2,3,7,8-dioxin isomer has been identified in sediment samples taken from storm sewers at Love Canal. Surface water sediment samples where

these storm sewers discharge also indicate the presence of this isomer at low ug/kg (parts per billion) levels.

Remedial action has been undertaken at the site resulting in containment through the installation of a clay cap, leachate collection system and leachate treatment facility. Other remedial measures are being undertaken at this State and Federal Superfund site, including the cleaning of storm and sanitary sewers and installation of an expanded and improved cap. Investigations of contamination in Black, Bergholtz, and Cayuga Creeks, in off-site sewers and in the 102nd Street delta of the Niagara River from the Canal are currently underway.

**B.3.1.4 Occidental Chemical, 102nd Street - Site 40 (902022)** - This site is located in the City of Niagara Falls and is adjacent to the Niagara River at mile point of 20.3.

The 5.6-hectare (14 acre) site was used from 1943-71 to dispose of the following:

<u>Type of Waste</u>	<u>Quantity (tons)</u>
Organic phosphates	100
Sodium hypophosphites	20,000
Inorganic phosphates	300
BHC cake	300
Chlorobenzenes	100
Miscellaneous 10 percent including other chloroorganics	2,000
Total	<u>22,800</u>

The geology of the site consists of fill overlaying alluvial river deposits which are underlain by a glaciolacustrine clay. The units are underlain by a thin layer of glacial till. These unconsolidated deposits overlie a bedrock of Lockport Dolomite.

There is a potential for contaminant migration to occur off-site. The fill overlies an alluvial river deposit which is probably hydrologically connected to the river.

A well drilled into the disposal area and sampled by the owner in 1979 indicated the following contaminants and their concentrations:

<u>Parameter</u>	<u>Concentration (ug/L)</u>
Arsenic <sup>1/</sup>	40
Mercury <sup>1/</sup>	6
Lead <sup>1/</sup>	140
Zinc <sup>1/</sup>	420
Benzene <sup>1/</sup>	7,700
Chlorobenzene <sup>1/</sup>	3,000
1,1,2,2-Tetrachloroethane <sup>1/</sup>	5,700
Chloroform <sup>1/</sup>	13,000
Tetrachloroethylene <sup>1/</sup>	12,000
Toluene <sup>1/</sup>	17,000
Trichloroethylene <sup>1/</sup>	5,000
BHCs (alpha & beta) <sup>1/</sup>	106
Phenol <sup>1/</sup>	44
2,4-Dichlorophenol <sup>1/</sup>	75
Trichlorobenzenes	7,400
1,2-Dichlorobenzene <sup>1/</sup>	5,900
1,3- & 1,4-Dichlorobenzene <sup>1/</sup>	23,000

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<sup>1/</sup> EPA priority pollutant

The site is currently under state and federal litigation.

**B.3.1.5 Griffon Park - Site 85 (932081)** - Griffon Park is located in the City of Niagara Falls adjacent to the Niagara River at mile point 20.2 and is also at the source of the Little River around Cayuga Island.

The park was used to dispose of an unknown quantity of incinerator residue and municipal solid waste and debris.

The geology of the site consists of approximately 10.4 metres (34 feet) of unconsolidated deposits of lacustrine clay and till overlying dolomitic bedrock.

One groundwater sample and three soil samples were collected on the site. The results of the soils analyses indicated elevated levels of copper

(63 ug/g maximum, 27 ug/g mean) and mercury (40 ug/g maximum, 16 ug/g mean). The water sample indicated the following priority pollutant metals:

<u>Parameter</u>	<u>Concentration (ug/L)</u>
Cadmium <sup>1/</sup>	6
Chromium <sup>1/</sup>	59
Lead <sup>1/</sup>	140
Mercury <sup>1/</sup>	1.3
Nickel <sup>1/</sup>	62
Zinc <sup>1/</sup>	3,920

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<sup>1/</sup> EPA priority pollutant

The following organic compounds were tentatively identified and semiquantified in the water sample: 2-(2-butoxyethoxy)-ethanol, and 4-(1,1-dimethylethyl)-phenol.

As pointed out in the general groundwater description of this area, mirex was reported in a well-water sample taken adjacent to this site along the river.

Additional analyses are required to confirm the extent of migration from this site.

**B.3.1.6 Bell Aerospace Textron - Site 5 (932052)** - This site is located in the Town of Wheatfield about 914 metres (3000 feet) from Cayuga Creek at mile point 4.3. Cayuga Creek enters the Niagara River at mile point 19.5.

The site consists of a neutralization pond which has been used since the 1950's. Wastes are held in the pond until a pH of 6-9 is achieved and are then discharged into a sanitary sewer. The wastes generally consist of rocket fuels, nitric acid, sodium hydroxide neutralizer, and plating wastes. The size of the pond is 914 metres (3000 feet) square.

The geology of the site consists of dolomitic limestone bedrock overlain by a sandy to silty glacial till. The till is overlain by a layer

of mixed silts, sands, and clays which is overlain by a varved clay and a layer of miscellaneous fill material. The layer of mixed silts, sands, and clays is conducive to the movement of groundwater. The dolomitic bedrock is greater than 6.1 metres (20 feet) below the surface.

As part of an ongoing remedial investigation program, several wells have been drilled on the site by the owner. The results of two water sample analyses collected at a downgradient well and analyzed by the owner for volatile organic compounds are presented below:

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Vinyl chloride	760	665
Methylene chloride <sup>1/</sup>	140,000	125,000
Trichlorofluoromethane <sup>1/</sup>	20,000	15,000
1,1-Dichloroethylene <sup>1/</sup>	310	275
1,1-Dichloroethane <sup>1/</sup>	150	140
Trans-1,2-dichloroethylene <sup>1/</sup>	16,000	14,000
Chloroform <sup>1/</sup>	1,000	910
1,2-Dichloroethane <sup>1/</sup>	20	15
1,1,1-Trichloroethane <sup>1/</sup>	670	630
Trans-1,3-dichloropropylene <sup>1/</sup>	35	27
Trichloroethylene <sup>1/</sup>	440,000	420,000
Benzene <sup>1/</sup>	110	66
Tetrachloroethylene <sup>1/</sup>	63	38
Toluene <sup>1/</sup>	84	65
Ethylbenzene <sup>1/</sup>	39	26

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<sup>1/</sup> EPA priority pollutant

**B.3.1.7 Charles Gibson - Site 242 (932063)** - The Charles Gibson site is located in the eastern part of the City of Niagara Falls and is adjacent to Cayuga Creek at mile point 1.3. Cayuga Creek enters the Niagara River at mile point 19.5.

The geology of the site should consist of a lacustrine clay deposit overlying a bedrock of Lockport Dolomite.

The 1.6 hectare (4 acre) site was used as a disposal site from 1955-57 for 403 drums (about 90 tons) of hexachlorobenzene and 101 truck

loads (about 1,000 tons) BHC cake by the Olin Corporation. A remedial investigation program has been developed for this site.

While samples of the materials deposited at the site have been analyzed, no other site data are presently available.

**B.3.1.8 Buffalo Avenue - Site 83 (932080)** - This site is located in the City of Niagara Falls between Buffalo Avenue and the Robert Moses Parkway along the Niagara River at mile point 17.9.

The area was formerly a wetland on which the City of Niagara Falls disposed of an unknown quantity of non-combustibles and incinerator residue from 1930 to 1950. Along the southern part of the area trap rock fill was used during the construction of the parkway.

The geology of the site consists of extensive areas of fill overlying clay, till, and alluvium. The thickness of the unconsolidated material is approximately 9.1 metres (30 feet). Underlying these units is a bedrock of Lockport Dolomite.

Nine soil samples were collected by the USGS and analyzed for mercury and organic compounds. Mercury was not observed above the detection limit. The following results were obtained at one boring which was 8.1 metres (26.5 feet) deep. The remaining eight shallow borings which were 0.6 to 2 metres (2 to 6.7 feet) deep indicated no organic parameters.

<u>Parameter</u>	<u>Concentration (ug/g)</u>
Phenanthrene <sup>1/</sup>	4,750
Fluoranthene <sup>1/</sup>	4,750
Pyrene <sup>1/</sup>	4,700
Benz(a)anthracene <sup>1/</sup>	2,000
Chrysene <sup>1/</sup>	3,100
Benzo(b)fluoranthene <sup>1/</sup>	1,325
Benzo(k)fluoranthene <sup>1/</sup>	1,100
Benzo(a)pyrene <sup>1/</sup>	2,700

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<sup>1/</sup> EPA priority pollutant

The following organic parameters were tentatively identified and semi-quantified in this boring: 2,6-dimethyl-2,5-heptadien-4-one, 4,5,7-trimethyl-lindane, E-4-(2-butenyl)-1,2-dimethylbenzene, 2,3,8-trimethyldecane, 2,7-dimethylundecane, nonadecane, 7-hexyldocosane, heptacosane, 2,4-dimethyl-4-heptanol.

Sixteen soil samples collected in 1981 by a potential buyer were each analyzed for seven organic compounds. The compounds and the levels observed were as follows:

<u>Parameter</u>	<u>Concentrations (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
1,3,5-Trichlorobenzene	0.181	0.144
1,2,4-Trichlorobenzene <sup>1/</sup>	0.898	0.529
1,2,3-Trichlorobenzene	0.228	0.175
Hexachlorobutadiene <sup>1/</sup>	0.077	0.054
Hexachlorocyclopentadiene	ND	ND
1,2,3,5- & 1,2,4,5-Tetra-chlorobenzene	0.253	0.158
1,2,3,4-Tetrachlorobenzene	1.0	0.602

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<sup>1/</sup> EPA priority pollutant

ND Not detected

Analyses of six additional samples collected by the USGS for organic compounds in May 1983 indicated 4,4'-DDT in one sample at 0.025 ug/g.

Additional analyses are required to confirm the extent of contaminant migration from this site.

**B.3.1.9 DuPont (Necco Park) - Site 14 (932047)** - The Necco Park landfill is located in the City of Niagara Falls and Town of Niagara and is 2.4 kilometres (1.5 miles) from the Niagara River at mile point 17.9.

The geology of the site consists of fill overlying a sequence of clays. The clays are underlain by a bedrock of Lockport Dolomite.

The 10.1 hectare (25 acre) site was used from 1930-77 for the disposal of 93,000 tons of sodium cell brick, graphite scrap and butts, sludge from brine plant salt dissolver, furnace brick and rubble, scrap Elvanol, chlorinolysis residues, and other chemicals. The site has been clay capped and three drawdown wells have been placed on the south side of the site to create a cone of depression and to collect leachate which infiltrates into the bedrock aquifer. A continuing remedial investigation program is on-going at this site.

The chemical data collected at the site and the adjacent areas indicates a definite leachate plume which has migrated south-southeast from the landfill. The plume has migrated into at least the top 6.1 metres (20 feet) of the Lockport Dolomite. It was estimated that the plume is advancing at the rate of 30.5 metres/year (100 feet/year) in the dolomite. Presently there is no evidence of contaminant migration to surface water bodies or sewer beds.

Samples taken from three wells in June 1982 by the owner indicate very high levels of organic priority pollutants as follows:

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Methylene chloride <sup>1/</sup>	3,000	1,967
Chloroform <sup>1/</sup>	26,000	18,333
Carbon tetrachloride <sup>1/</sup>	63,000	25,703
1,1,2-Trichloroethane <sup>1/</sup>	12,000	6,433
Tetrachloroethane <sup>1/</sup>	19,000	11,333
1,1-Dichloroethylene <sup>1/</sup>	530	243
Trans-1,2-dichloroethylene <sup>1/</sup>	5,400	2,730
Tetrachloroethylene <sup>1/</sup>	34,000	12,733
Trichloroethylene <sup>1/</sup>	45,000	25,667
Hexachloro-1,3-butadiene <sup>1/</sup>	42,000	14,600
Benzene <sup>1/</sup>	800	267
Toluene <sup>1/</sup>	590	245

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<sup>1/</sup> EPA priority pollutant



**B.3.1.10 Reichhold-Varcum Chemical Division - Site 66 (932040)** - The Reichhold-Varcum site is located in the eastern portion of the City of Niagara Falls. The site is about 2.9 kilometres (1.8 miles) from the Niagara River at mile point 17.7.

Until 1979, a settling pond was used on the site for the removal of phenolic waste sludge from plant wastewater. The pond was removed from service in 1979 and all excavated materials were placed in a secure landfill. Monitoring wells were subsequently installed on the plant site in 1981 and 1982 to determine the impact the lagoon and phenol storage area had on the groundwater beneath the plant site.

The geology of the site consists of a dolomitic limestone bedrock overlain with 8 feet of unconsolidated deposits of glacial till overlain by a clayey soil and lacustrine clay. The clayey soil is overlain by a gravelly fill.

Data collected by the owner from monitoring wells screened above and below the clay layer show elevated levels of phenols. The maximum and mean values from monitoring wells screened below the clay layer and located near the perimeter of the plant site are as follows:

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Phenol	330,000	64,000
Total organic halogens	73.2	39.4

An investigation program is continuing at this site.

**B.3.1.11 Occidental Chemical, Buffalo Avenue, S-Area - Site 41A (932019-a)** - The S-Area is located in the southeast corner of the Occidental Chemical, Buffalo Avenue plant in the City of Niagara Falls which is adjacent to the Robert Moses Parkway along the Niagara River at mile point 17.5.

The 6.4 hectare (16 acre) landfill was used to dispose of 63,100 tons of organic phosphates, acid chlorides, phenol tars, thionyl chloride, HET acid, TCP, benzoyl chloride, liquid disulphides/monochlorotoluene, metal chlorides, thiodan, chlorobenzenes, and miscellaneous chlorinations.

In 1978, organic chemicals were discovered in the shore shaft intake structure and forebay of the City of Niagara Falls water treatment plant. The contamination was traced to disposal activities in the S-Area. The site is currently under federal and state litigation.

The geology of the site consists of fill ranging from 2.6 to 5.3 metres (8.5 to 17.5 feet) in thickness, overlying natural sand and silt deposits. The thickness of these deposits ranges between 4.3 to 5.3 metres (14 and 17.5 feet). Below these deposits is a till stratum composed predominantly of silt and rock fragments, ranging in thickness from 0.3 to 1.5 metres (1 to 5 feet). Underlying these unconsolidated deposits is Lockport Dolomite.

Water levels measured in wells in the unconsolidated deposits in February, 1980 imply that groundwater flow is essentially radial at this site.

Similarly, water levels collected in observation wells screened in the bedrock suggest that groundwater flow is toward the northwest.

Chemical data from samples collected by the owner from a well located south of the Robert Moses Parkway along the Niagara River and wells along the southern portion of the S-Area indicate highly elevated levels of organic contaminants. Based on the known groundwater flow pattern in the area and this information on organic contaminant levels, chemical migration is very likely from this site. Statements presented in support of the recent application for a Settlement Agreement have indicated that "...chemicals have migrated off-site into other areas and have entered or may enter the Niagara River".

The compounds and their concentrations are as follows:

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Trans-1,2-dichloroethylene <sup>1/</sup>	261	162
Chloroform <sup>1/</sup>	1,750	530
Trichloroethylene <sup>1/</sup>	6,870	1,774
Benzene	3,860	1,799
1,1,2,2-Tetrachloroethylene	15,400	5,621
Toluene <sup>1/</sup>	1,420	588
Chlorobenzene <sup>1/</sup>	4,160	1,781
Phenol <sup>1/</sup>	2,990	1,184
Dichlorobenzenes	2,980	758
Hexachloroethane <sup>1/</sup>	4,450	912
Hexachlorobutadiene <sup>1/</sup>	22,800	4,995
Hexachlorocyclopentadiene <sup>1/</sup>	12,000	2,400
Hexachlorobenzene <sup>1/</sup>	25,200	5,319
Trichlorobenzenes	50,400	11,318
Tetrachlorobenzenes	223,000	45,521
Monochlorotoluenes	9,300	2,264
Dichlorotoluenes	5,840	1,271
Octachlorocyclopentene	15,000	3,000
Trichlorophenols	1,280	257
Hexachlorocyclohexanes	789	253
Mirex	1,610	463
Carbon tetrachloride <sup>1/</sup>	7,400	1,496
Pentachlorobenzene	1,200	255

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<sup>1/</sup> EPA priority pollutant

#### B.3.1.12 Occidental Chemical, Buffalo Avenue Plant - Sites 41B-49 (932019b-1)-

These sites are located on the Occidental Chemical (Buffalo Avenue Plant) site in the City of Niagara Falls adjacent to the Robert Moses Parkway along the Niagara River at mile point 17.3. The S-Area, which is also on the plant site, is discussed separately. The disposal sites contain mostly unknown quantities of organic chemicals, metals, chlorides, sulfides and phosphorus compounds.

Approximately 120 monitoring wells have been installed to determine the hydrogeologic system and extent of groundwater contamination at the plant.

Sometime in the past, the Niagara River flowed over part of the southern property of the site. North of this ancient shoreline the stratigraphy consists of poorly sorted fill averaging 4.0 metres (13 feet) thick, which overlies very fine sand or a clay layer of approximately 1.8 metres (6 feet). This overlies a till which in turn overlies the Lockport Dolomite. South of the ancient shoreline, the clay is usually absent and the till thins or is absent. The thickness of the very fine sand and fill is greater where the clay and till is thin or absent.

Water levels in wells installed in the unconsolidated deposits revealed a flow direction to the south toward the Niagara River.

Water levels in wells installed in the Lockport Dolomite indicate groundwater moving northwest, away from the Niagara River. At the site, groundwater in the Lockport Dolomite is recharged by the Niagara River.

Eleven plant site wells installed in the unconsolidated deposits along the Robert Moses Parkway were sampled from May to July 1980 by the owner. Results indicate highly elevated levels of organic contaminants in the water.

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Trichloroethylenel/	400,000	71,790
Tetrachloroethylenel/	32,000	7,120
Toluene <sup>1</sup> /	2,940	435
Chlorobenzotrifluorides	400	112
Monochlorobenzene <sup>1</sup> /	1,025	255
Dichlorobenzenes	31,000	5,830
Chlorotoluenes	79,000	10,500
Dichlorotoluenes	14	12
Trichlorobenzenes	150	44
Tetrachlorobenzenes	240	125

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<sup>1</sup>/ EPA priority pollutant

These sites are under litigation.

B.3.1.13 Solvent Chemical - Site 251 (932096) - The Solvent Chemical site is located in the City of Niagara Falls 305 metres (1000 feet) from the Niagara River at mile point 16.6.

The site was used for the production of chlorinated benzenes; dichloro, trichloro, and tetrachlorobenzene were produced between 1974 and 1978. Earlier occupancy of the site is reported to have been by area chemical firms.

The geology of the site consists of fill, recent alluvium including silt, silty clay and fine to medium sand, and discontinuous glacial till and clay with a total depth varying from 1.5 to 3.0 metres (5 to 10 feet). This material overlies the Lockport Dolomite bedrock.

Nine monitoring wells were installed in the unconsolidated deposits at the plant site in July and August 1980. Samples obtained from these wells by the owner indicate the following highly elevated levels of ammonia, zinc, and organic compounds:

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Ammonia as N	240,000	32,680
Zinc <sup>1/</sup>	230,000	36,840
1,2-Dichlorobenzene <sup>1/</sup>	260,000	35,070
1,3-Dichlorobenzene <sup>1/</sup>	27,000	4,770
1,4-Dichlorobenzene <sup>1/</sup>	87,000	19,790
1,2,3-Trichlorobenzene	10,000	1,370
1,2,4-Trichlorobenzene <sup>1/</sup>	67,000	8,780
Monochlorobenzene <sup>1/</sup>	110,000	35,690
Benzene <sup>1/</sup>	170,000	32,500

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<sup>1/</sup> EPA priority pollutant

This site is under litigation.

B.3.1.14 DuPont (Buffalo Avenue Plant) - Sites 15-19, 250 (932013 a-f) -

These sites are located at the Buffalo Avenue plant site in the City of Niagara Falls which is adjacent to the Robert Moses Parkway along the Niagara River at mile point 16.5.

Each of the six sites identified at the Buffalo Avenue facility was used for the disposal of different materials. The following is a brief description of each along with the remediation status of each site:

<u>Site</u>	<u>Material &amp; Quantity</u>	<u>Remediation Status</u>
15-West yard (near Building 201)	Sodium cyanide (500 tons)	Leachable cyanide within groundwater standard
16-Disposal Area (east of Building 301)	Metal cyanide (500 tons)	Leachable cyanide within groundwater standard
17-Building 107	Trichloroethylene and perchloroethylene (quantity unknown)	Site contents excavated
18-South Boundary	Metal cyanide sludge (quantity unknown)	Site contents excavated
19-Parking Lot	Metal sludge, cell bricks, rubble, demolition debris (quantity unknown)	Heavy metals in soil samples less than background
250-Disposal Area (near Building 310)	Polychlorinated biphenyls (quantity unknown)	Site contents excavated

The plant site was built on fill which is underlain by previous river bottom sediments. These sediments are generally silts and clays. Underlying these sediments is a bedrock of Lockport Dolomite. The depth to bedrock is approximately 3.0 metres (10 feet).

In general, groundwater in the unconsolidated deposits flows to the Niagara River or Gill Creek, whereas groundwater in the bedrock flows away from the Niagara River.

Recent test drilling and groundwater sampling was undertaken by USGS in the unconsolidated deposits above the bedrock contact on the northern side of the Robert Moses Parkway adjacent to the plant. The parkway, which is not a barrier to groundwater movement, is located between the plant and the

Niagara River and because of its porous bed may facilitate migration. The analyses indicate very high concentrations of contaminants as follows:

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Antimony <sup>1/</sup>	1.3	1.1
Arsenic <sup>1/</sup>	27	9.7
Beryllium	10	1.5
Cadmium <sup>1/</sup>	3	2.2
Chromium <sup>1/</sup>	11	7
Copper <sup>1/</sup>	71	18
Lead <sup>1/</sup>	430	105
Mercury <sup>1/</sup>	5.9	2.0
Nickel <sup>1/</sup>	20	8.8
Selenium <sup>1/</sup>	0	0
Silver <sup>1/</sup>	9,200	3,644
Cyanide <sup>1/</sup>	3,000	626
Methylene chloride <sup>1/</sup>	2,200,000	464,462
Trans-1,2-dichloroethylene <sup>1/</sup>	20,000	5,856
Chloroform <sup>1/</sup>	150,000	32,233
Trichloroethylene <sup>1/</sup>	470,000	104,449
1,1,2,2-tetrachloroethane	310,000	64,215
Tetrachloroethylene <sup>1/</sup>	48,000	10,044
Benzene <sup>1/</sup>	44	8.8
Toluene <sup>1/</sup>	1,200	410
Chlorobenzene <sup>1/</sup>	4.3	0.9
1,2,3,4,5,6-Hexachloro(1 alpha, 2 alpha, 3 beta, 4 alpha, 5 beta, 6 beta)-cyclohexane	35	7.0
Phenol <sup>1/</sup>	14	2.8
Dimethyl sulfide	31	6.2
Alpha BHC <sup>1/</sup>	49	10
Beta BHC <sup>1/</sup>	47	9.69
Dibenzanthracene	10	2
Lindane <sup>1/</sup>	7.9	1.64
Heptachlor <sup>1/</sup>	0.67	0.13
Diethyl phthalate <sup>1/</sup>	10	5.6
Dibutyl phthalate <sup>1/</sup>	23	10.6
Butylbenzyl phthalate <sup>1/</sup>	29	5.8
Bis(2-ethylhexyl) phthalate <sup>1/</sup>	22	9.2
1,2-Dichlorobenzene <sup>1/</sup>	14	2.8
1,4-Dichlorobenzene <sup>1/</sup>	13	2.6
Hexachloroethane <sup>1/</sup>	280	56

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<sup>1/</sup> EPA priority pollutant

The following organic compounds were identified tentatively and semi-quantified: hexane, acetone (2-propanone), 2,2,4-trimethylpentane, methylcyclopentane, 3-methylpentane, 2-methylthietane, 1-(2-butoxyethoxy)-ethanol, 1,1'-oxybis(4-chloro)-butane, 1,1,2-trichloroethane, tetrachloroethane, pentachloroethane, 1,3-dichlorobenzene, pentachlorocyclopropane, 1,1,3,4-tetrachloro-1,3-butadiene, 1,2,4-trichlorobenzene, hexanedinitrile, 1,2,3-trichlorobenzene, hexachlorobutadiene, hexachlorobutene, 1,3,5-trithiane, 1-propoxybutane, 1,2,3,4,5,6-hexachloro-(1 alpha, 2 beta, 3 alpha, 4 beta, 5 alpha, 6 beta)-cyclohexane, 1,2,3,4,5,6-hexachloro-(1 alpha, 2 alpha, 3 beta, 4 alpha, 5 alpha, 6 beta)-cyclohexane, 1,2,3,4,5,6-hexachloro-(1 alpha, 2 alpha, 3 beta, 4 alpha, 5 beta, 6 beta)-cyclohexane, 2-butoxyethylbutyl phthalate, dimethylsulfide, and 1,7,7-trimethylbicyclo-(2.2.1)-heptan-2-one(camphor).

A detailed remedial investigation program under state supervision is currently underway at this facility.

**B.3.1.15 Olin, Buffalo Avenue Plant - Sites 58, 59, 248 (932051a, b; 932038)**

- These sites are located in the City of Niagara Falls at the Olin Buffalo Avenue plant site. The plant site is adjacent to Gill Creek at mile point 0.2 which flows into the Niagara River at mile point 16.3.

Sites 58 and 59 were used for landspreading brine sludge containing mercury and possibly PCBs. Site 248 is a pond which was used to collect overflow water containing traces of mercury.

The geology of the sites consists of fill and debris underlain by a sandy clay. Four test borings were drilled on Site 58 and six were drilled along the perimeter of Sites 59 and 248.

No groundwater was encountered during the test drilling program. If groundwater exists in the unconsolidated deposits, the flow direction is anticipated to be southerly toward the river.



Soil samples were collected by USGS at each test boring. Each sample was analyzed for mercury and organic compounds. At Site 58, mercury was quantified (0.33 ug/g maximum, 0.09 ug/g mean). At sites 59 and 248 mercury was quantified by USGS (0.22 ug/g maximum, 0.07 ug/g mean) along with benzene (48 ug/g maximum, 8 ug/g mean).

Each of the samples were split with the Olin Corporation and their results are as follows:

#### Site 58

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Mercury <sup>1/</sup>	20	6.2
Cyanide <sup>1/</sup>	4.8	1.55

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<sup>1/</sup> EPA priority pollutant

#### Sites 59 & 248

<u>Parameter</u>	<u>Concentration (ug/g)</u>	
	<u>Maximum</u>	<u>Mean</u>
Mercury <sup>1/</sup>	40	12.1
Pesticides-non BHC	0.04	0.01
Pesticides-BHC	0.1	0.03
Cyanide	2	0.53

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<sup>1/</sup> EPA priority pollutant

Ten monitoring wells were installed by Olin in the eastern area of the plant site adjacent to Gill Creek in 1980. Sampling from 1980 through 1982 indicates the following concentrations at the downgradient well which was drilled to the top of bedrock in the southeastern area of the plant.

#### Olin Plant Site - Downgradient Well

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Mercury <sup>1/</sup>	21.5	13.5
2-Chlorophenol <sup>1/</sup>	170	56
3-Chlorophenol & 4-Chlorophenol	98	47
2,3-+ 2,4-+ 2,5-Dichlorophenol <sup>1/</sup>	83	33
2,4,5-+ 2,3,4-Trichlorophenol	140	49

TABLE (continued)

Olin Plant Site - Downgradient Well

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
2,3,4,6-Tetrachlorophenol	50	23
Pentachlorophenol <sup>1/</sup>	50	23
Gamma-BHC (Lindane) <sup>1/</sup>	4,200	1,248
Total halogenated organics	14,000	4,087
Total volatile halogenated organics	9,400	4,287

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<sup>1/</sup> EPA priority pollutant
B.3.2 Lower River Segment

B.3.2.1 Occidental Chemical (Hyde Park) - Site 39 (932021) - The Hyde Park landfill occupies 6.1 hectares (15 acres) in the northwest corner of the Town of Niagara, adjacent to Bloody Run Creek which is a tributary to the Niagara River at mile point 9.4. The site was active from 1953-75, and was used for the disposal of 80,000 tons of chemical wastes related to fertilizers, plastics, and various industrial products. The type of chemical wastes landfilled are listed as follows:

Calcium fluoride	Trichlorophenol
Hexachlorocyclopentadiene derivatives	Benzotrichloride derivatives
Mercury brine sludge	Benzoyl chloride
Organic phosphates	Liquid disulphides/
Dechlorane	monochlorotoluene and
Benzotrichloride	inorganic phosphites
Chlorotoluenes	Chlorobenzenes
Chlorendic Acid	Benzyl chloride
Dodecyl mercaptans	Thiodan
	Miscellaneous chlorinations
	Acid chlorides

Glacial deposits, 3.0 to 10.7 metres (10-35 feet) thick and consisting of till and lacustrine clay, silt, and fine sand, overlie the Lockport Dolomite.

The Lockport Dolomite in the Hyde Park area ranges in thickness from 27.4 to 39.6 metres (90-130 feet). Depth to bedrock is generally less than 4.6 metres (15 feet) east of the landfill and then increases to about 10.6

metres (35 feet) west of the landfill. The Lockport Dolomite is an aquifer whose upper 3.0 to 4.6 metres (10 to 15 feet) is the most permeable zone (Johnston, 1964)<sup>1</sup>. Underlying the Lockport Dolomite is the Rochester Shale, a relatively impermeable unit.

The data collected indicate that leachate generated in the landfill has infiltrated into the unconsolidated deposits and the Lockport Dolomite. Elevated concentrations of metals and organic compounds have been found in both units.

Seven samples were collected by the owner and EPA in 1978 at two wells screened in the unconsolidated deposits near the northwest corner of the site. The results of these analyses are presented below to characterize the site.

Parameter	Concentration (ug/L)	
	Maximum	Mean
Antimony <sup>1</sup> /	270	65
Arsenic <sup>1</sup> /	52	36
Barium	870	485
Chromium <sup>1</sup> /	452	246
Copper <sup>1</sup> /	1,900	1,027
Lead <sup>1</sup> /	1,360	1,199
Nickel <sup>1</sup> /	600	240
Selenium <sup>1</sup> /	22	11
Thallium <sup>1</sup> /	150	40
Zinc <sup>1</sup> /	64,800	31,096
Benzene <sup>1</sup> /	810	360
Carbon tetrachloride <sup>1</sup> /	1,800	302
Chlorobenzenes	1,516	642
1,2-Dichloroethane <sup>1</sup> /	901	361
1,1,1-Trichloroethane <sup>1</sup> /	7	1
1,1,2-Trichloroethane <sup>1</sup> /	280	59
1,1,2,2-Tetrachloroethane <sup>1</sup> /	92	24
Chloroethane <sup>1</sup> /	110	16
Chloroform <sup>1</sup> /	2,000	951
1,1-Dichloroethylene <sup>1</sup> /	270	39
Trans-1,2-dichloroethylene <sup>1</sup> /	240	74
1,2-Dichloropropane <sup>1</sup> /	18	3
Ethylbenzene <sup>1</sup> /	1,000	310
Methylene chloride <sup>1</sup> /	740	401
Trichlorofluoromethane <sup>1</sup> /	88	13

<sup>1</sup> Johnston, Richard H., Groundwater in the Niagara Falls Area, New York, 1964.

TABLE (continued)

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Tetrachloroethylene <sup>1/</sup>	3,800	942
Toluene <sup>1/</sup>	4,800	2,311
Trichloroethylene <sup>1/</sup>	1,040	531
1,2-cis-Dichloroethylene	195	86
2-Chloronaphthalene <sup>1/</sup>	10	2
Dichlorobenzenes	320	30
Bis(2 ethylhexyl) phthalate <sup>1/</sup>	310	31
Phenol <sup>1/</sup>	684,500	94,090
BHCs <sup>1/</sup>	249	19
2,4,6-Trichlorophenol	630	148
2,4-Dichlorophenol <sup>1/</sup>	2600	534
Chlorobenzoic acids	370,000	189,400
1,2,4-Trichlorobenzene <sup>1/</sup>	1,100	202
Hexachloroethane <sup>1/</sup>	2,300	321
Hexachlorobutadiene <sup>1/</sup>	2,000	272
Hexachlorobenzene <sup>1/</sup>	700	108
Mirex	158	84

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<sup>1/</sup> EPA priority pollutant

Analyses of samples of sediment in Bloody Run Creek adjacent to the site have indicated the presence of the 2,3,7,8-dioxin isomer at low ug/kg (part per billion) levels.

This site is currently undergoing an intensive investigation by Occidental Chemical Corporation under the terms of a negotiated settlement agreement approved by the Federal Court. The remedial program will include Bloody Run Creek. The site has been identified as a source of contamination to the Niagara River.

#### B.4 Chippawa Sub-area

##### B.4.1 Fort Erie Municipal Landfill (Bridge St.) (Provincial C of A #A120501)

Operation of the Bridge Street municipal disposal site (location B on Figure 3.1) by the Town of Fort Erie predates 1972. The landfill annually accepts approximately 19,000 tonnes (20,900 tons) composed of 50% domestic

waste, 30% commercial waste, 5% non-hazardous industrial waste, 5% sewage sludge, and 10% stumps, brush, and construction rubble. The landfill will occupy 16.2 hectares (40 acres) of a total 38.4 hectare (95 acres) area when full, although the Town of Fort Erie is proposing to expand the landfill northwards. At present, about 12 hectares (30 acres) of the total area is either completed or active. The south half of the site is closed landfill, completed to 1-5 metres (3-15 feet) above grade, and the active landfill on the north side is mounded to 15 metres (50 feet) above ground.

Industrial users of the site include:

- Canadian Oxy Chemicals - Durez Div. (cardboard, empty fibre drums, wooden pallets, and paper)
- Lucidol Div. of Penwalt (Filteraid, empty steel drums, cardboard, phosphate, plastic containers)
- Pierce & Stevens (paper bags, pallets, empty pails, lunchroom wastes)
- Pratt & Whitney (steel drums, outdated paint and paint sludges, scrap metal, pallets, paper wastes)

Original operations at the site involved the excavation of 3-4 metre (10-13 feet) deep trenches which were used for waste disposal. The excavated material was used for cover after filling. This method was discontinued when, due to the high water table, groundwater filled the trenches faster than they could be landfilled. Present operations comprise surface disposal on the north and west faces of the active mound. Depth to bedrock ranged from 6.80 metres (22.3 feet) to 8.11 metres (26.6 feet) at five drilled locations around the landfill site.

The landfill is situated adjacent to the headwaters of Miller Creek which flows northeast to the Chippawa Channel of the Niagara River across from Beaver Island. A significant portion of the leachate has migrated into the groundwater regime; three observation wells showed elevated levels of some leachate indicators including most major ions, phenols, and in some cases dissolved organic carbon.

Surface samples collected at the site in 1982 indicate the following:

<u>Parameter</u>	<u>SURFACE DRAINAGE</u>	<u>Concentration (ug/L)</u>
Aluminum		26.0
Arsenic		3.0
Cadmium		0.2
Chromium		0.7
Copper		15.0
Mercury		<3.0
Nickel		0.8
Lead		<1.2
Selenium		<3.0
Silver		<0.4
Zinc		45.0
Cyanide		<0.1
Methylene chloride		5.1
Toluene		<0.1
Acetone		0.1-1.0
Carbon disulphide		0.1-1.0
Tetrahydrofuran		1.0-10.0
Methylethyl ketone		1.0-10.0
1,4-Diethylene dioxide		0.1-1.0
Dimethyl disulphide		0.1-1.0
Methyloctanoate		1.0-10.0

#### B.5 Niagara Falls Sub-area

##### B.5.1 Atlas Landfill (Provincial C of A #A120409)

The landfill is located in Welland at the corner of River Road and Cambridge Road, between the old Welland Canal and the Welland Ship Canal (location C on Figure 3.1). The site occupies low-lying valley land adjacent to the Welland River and has been in use since 1930 as a slag depository for Atlas' north and south plants. The site is licensed to receive 40,500 tonnes (44,550 tons) of waste per year.

Over the years, the primary waste deposited at the site has been electric furnace slag from both carbon steel and stainless steel production. This slag is composed of calcium oxide and silicon dioxide and minor amounts of alumina, magnesium oxide, manganese oxide, chromate, and iron oxides. Other wastes deposited at this landfill are concrete rubble, excavated soils,

refractory rubble, lining bricks, bag-house dust (pelletized), scale, sludge from Atlas' WPCPs, and grinding swarf.

The site has also been used for disposal of spent acid wastes and acid rinses, specifically, sulphuric acid, nitric acid, hydrofluoric acid, hydrochloric acid, and caustic sludge (75% NaOH). These wastes were placed in a clay depression with walls built from slag containing lime to aid neutralization.

The southeast corner of the site has been covered with a clay cap. A clay berm has been constructed around the toe of the landfill and leachate and runoff are directed to a small holding pond. Liquid from this pond overflows through a concrete weir to the river.

This landfill is situated on the east bank of the Welland River. Wastes up to 10 metres (30 feet) deep are placed on the sloped clay embankments. Local well records show that stratigraphy is 15 to 30 metres (50-100 feet) of clay material overlying a thin but variable seam of gravel, sand, or gravelly clay, 1 to 2 metres (3-6 feet) thick. Below the clays in the saturated zone is limestone bedrock. Typical hydraulic conductivities of these clay units range from  $10^{-6}$  cm/s to  $10^{-9}$  cm/s in the unweathered clay but could be as high as  $10^{-4}$  cm/s in the fringe of weathered surficial clay.

From the constitution of the overburden as well as its depth, it would be expected that contamination of the groundwater aquifer should not be a problem. The greatest concern would be surface seeps and springs.

Liquid collected at the overflow weir in 1982 indicated the following:

<u>RESULTS FROM SAMPLES COLLECTED AT OVERFLOW WEIR</u>	
<u>Parameter</u>	<u>Concentration (ug/L)</u>
Aluminum	40.0
Arsenic	<3.0
Cadmium	4.5

<u>Parameter</u>	<u>Concentration (ug/L)</u>
Chromium	0.5
Copper	<0.2
Mercury	4.0
Nickel	120.0
Lead	20.0
Selenium	<30.
Zinc	69.0
Cyanide	1.5
1,1-Dichloroethylene	0.2
Trans-1,2-Dichloroethylene	1.0-10.0
Chloroform	0.1
Benzene	0.1
Trichloroethylene	31.5
Toluene	1.2
p-Xylene	0.1
o-Xylene	0.1
Ethanol	0.1-1.0
Acetone	0.1-1.0
Carbon disulphide	0.1-1.0
Butanol	0.1-1.0
Cyclobutanone	0.1-1.0
Methylethyl Ketone	0.1-1.0
Methylfuran	0.1-1.0
Thiophene	0.1-1.0
Formaldehyde dimethyl acetal	0.1-1.0
n-Butanol	0.1-1.0
Hexane	0.1-1.0
Dimethylbutanone	0.1-1.0
Methylisobutyl ketone	0.1-1.0
Decane	0.1-1.0
Alkene (C <sub>10</sub> H <sub>14</sub> )	0.1-1.0
Aliphatic alcohols	0.1-1.0
Terpineol	1.0-10.0
Vanilline	1.0-10.0
Acetovanillone	1.0-10.0
Syringaldehyde	1.0-10.0
Phthalates	1.0-10.0

#### B.5.2 C.N.R. Victoria Avenue Landfill

This disposal site is located near the west corner of Victoria Avenue and the Niagara Parkway in Niagara Falls (location D on Figure 3.1). The site has been used since the late 1960's and owned and operated by Canadian National Railways (C.N.R). This landfill is located in a swale which



originates on C.N.R property and continues to the Niagara Parkway where clean fill has been added to accommodate the roadway and adjoining parkland strip. The swale drains through a culvert below the fill zone and discharges to the Niagara River from the side of the gorge at the Whirlpool. The site was closed in 1981.

The C.N.R. site was used for about 15 years as an open-faced disposal area for wastes produced from car cleaning activities at the Niagara Falls railyards. Wastes deposited at this site include but are not limited to metal waste, wood scrap, foundry magnets, paper, and general waste. A wide variety of materials pass through this yard, and wastes from any of these materials may be deposited at this site.

It is suspected that the potential for the vertical migration of contaminants to the dolomite aquifer is greater in the swale than surrounding areas, due to a thinning of the clay overburden in the swale. This would allow contaminants to pass through the slightly permeable sandy-clay layer into the more permeable dolostone bed. From this point, contaminants would move with the groundwater flow through the Lockport Aquifer to the Niagara River at the Whirlpool.

Leachate was collected from the bottom of the swale in December of 1982. These results are given below:

C.N.R. VICTORIA AVE. LANDFILL RUNOFF STREAM

<u>Parameter</u>	<u>Concentration (ug/L)</u>
Aluminum	5.3
Arsenic	<3.0
Cadmium	<0.2
Chromium	0.8
Copper	4.3
Mercury	<2.0
Nickel	4.9
Lead	4.0
Selenium	<3.0
Zinc	190.0

TABLE (continued)

<u>Parameter</u>	<u>Concentration (ug/L)</u>
Cyanide	<0.1
Alpha-BHC	2
Hexachlorobenzene	3
Chloroform	0.1
Toluene	0.1
p-Xylene	<0.1
m-Xylene	0.1
Ethanol	<0.1
Acetone	0.1-1.0
Dimethylbutanone	0.1-1.0

### B.5.3 Cyanamid Niagara Falls

There is no active landfill at this location (identified as location E on Figure 3.1). During the 1940s, Cyanamid's Fourth Avenue Plant generated a waste with a significant cyanide content (0.16% total cyanide, 0.03% free cyanide). Some 32,000 tonnes (35,200 tons) of this material was stored on property belonging to Ontario Hydro. This property includes a low gully and is located adjacent to the Queenston-Chippawa Power Canal, immediately north of the CN rail line that loops across the canal due west of the whirlpool and south of the Niagara Falls STP.

During the late 1970's, Ontario Hydro requested that Cyanamid remove this material. Most of the waste transported to the Welland property, although some traces still remain. The waste was cleared to ground level; but, the gully/depression may still contain a considerable amount of this waste.

Historically, waste generated at the Fourth Avenue plant was composed of lime, carbon, slaked lime and calcium carbide, calcium carbonate, calcium oxide wastes and lining bricks, powdered coal, coke, and limestone. Wastes from the production of calcium cyanamide are recycled and not land dumped.

#### B.5.4 Cyanamid Welland Landfill (Provincial C of A #A120203, A820065)

Three licensed disposal sites are presently being used on this property (location C on Figure 3.1). In addition to these sites, Cyanamid also has eleven bermed lagoons or cells. Ten cells have been closed and covered. The cells vary in shape and size and have received waste slurries from the Welland Plant since 1942. Cell #6 in particular received 32,000 tonnes (35,200 tons) of cyanide-bearing waste from the Niagara Falls plant (0.16% total cyanide, 0.03% free cyanide). The neutral slurry (pH = 6) contains 15 to 20% solids consisting of approximately 50%  $\text{CaCO}_3$ , and 10% carbon. The slurry is pumped to the active pond a 5-6 metres (16-18 ft.) high, clay-bermed lagoon constructed of excavated material on the clay overburden surface, where solids are settled out and the decant released to Thompsons Creek.

The entire cell system covers some 97 hectares (240 acres) of surface area. The cells are filled to a depth of 12 metres (40 feet) with the wastes. Although occasional instances of berm failure have been noted in the past, no recurrence has taken place since 1974. Mine tailings are located on Cyanamid's property to the west of the West Dumpsite. They are from an abandoned mining concern (a prior user of the site) and not associated with Cyanamid.

The Brown Road Dumpsite is located atop cells #4 and #6 and has been operating since 1974. It receives wastes from the Niagara Falls plant (Fourth Ave.), and is composed largely of lime, limestone, carbon, ash, calcium carbonate, calcium oxide, broken brick, rubble and coke dust.

Cyanamid was involved in litigation with the Provincial Ministries of Environment and Labour during 1983. A settlement agreement was reached between the parties and accepted by the court. The entire Cyanamid Welland Property was reclassified as a waste disposal site, and Cyanamid is required to conduct a thorough hydrogeological evaluation of the site to be submitted to and approved by the Ministry of the Environment. Remedial actions will be

determined based on the results of this evaluation.

Metals analysis of groundwater taken from the shallow weathered clay was found to contain the following:

RESULTS OF SAMPLES TAKEN FROM MONITORING WELLS

<u>Parameter</u>	<u>Concentration (ug/L)</u>	
	<u>Maximum</u>	<u>Mean</u>
Aluminum	180.0	96.0
Cadmium	0.6	0.4
Cyanide (total)	<0.1	<0.1
Chromium	0.6	0.4
Copper	1.7	1.5
Nickel	0.4	0.3
Lead	4.8	3.6
Zinc	14.0	4.5

**B.6      Additional Support Information**

The following tables are provided to supplement material in Chapter II; references to these tables appear in the text of Chapter II where appropriate.

TABLE B.1

SUMMARY OF U.S.G.S. FIELD ACTIVITIES ASSOCIATED WITH THE NIAGARA RIVER  
NON-POINT SOURCE ASSESSMENT PROGRAM IN NEW YORK

SITE NAME AND NUMBER	FIRST SAMPLING DATE	TEST HOLES DRILLED	EXISTING WELLS	NUMBER OF WATER SAMPLES		NUMBER OF SEDIMENT SAMPLES	GC/MS EXTRACTABLES	NUMBER OF SAMPLES FOR EACH PARAMETER													
				Ground water	Surface water			Volatiles	As	Cd	Cr	Cu	Fe	Pb	Hg	Ni	V	Zn	Cn	S	
Holiday Park (072)	06-17-82	6	2	7	1	3	12 ( 4*)	-	-	-	-	12	12	-	-	-	-	-	-	-	
Botanical Gardens(243)	06-18-82	-	2	3	-	-	3*	-	-	-	-	3	3	-	-	-	-	-	-	-	
Lynch Park(076)	06-19-82	3	-	-	-	-	3	-	-	-	-	3	3	-	3	-	-	-	-	-	
Buffalo Pumps(006)	06-21-82	2	-	2	-	1	3 ( 1*)	-	-	-	3	3	3	-	-	-	-	-	-	-	
Frontier Chemical(067)	06-22-82	3	-	1	2	2	-	-	-	5	5	5	5	-	-	5	-	5	-	-	
NCDR, Wheatfield(081)	06-22-82	9	2	3	-	12	12 ( 1)	-	-	-	-	-	-	-	-	-	-	-	-	-	
Nash Road(093)	06-24-82	4	-	2	-	4	6	-	6	6	6	6	6	6	6	6	-	-	-	-	
Buffalo Avenue(083)	06-25-82	32	-	-	-	12	12 ( 7*)	-	-	-	-	-	11	-	11	-	-	-	-	-	
Belden, Niagara River site	06-26-82	2	-	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	
Gratwick Park(063)	06-28-82	1	4	5	-	-	5	5	5	5	5	5	5	5	5	5	-	-	-	-	
Great Lakes Carbon(022)	06-28-82	3	-	-	2	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Whirlpool(089)	06-28-82	6	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
Art Park	06-28-82	5	-	-	1	3	4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Rodeway Inn(297)	06-29-82	2	-	-	-	2	2*	-	-	-	-	-	2	-	2	-	-	-	-	-	
Whitmer Road(090)	06-29-82	2	-	-	-	2	2*	-	-	-	-	2	2	-	2	-	-	-	-	-	
Chisholm Ryder	06-30-82	3	-	-	-	3	3	-	-	3	3	3	3	3	3	-	-	3	-	-	
Bell Aerospace(005)	07-01-82	4	-	-	-	2	-	-	-	2	2	2	2	-	-	-	-	-	-	-	
64th Street North	07-02-82	6	-	-	-	2	2 ( 1*)	-	-	-	-	-	2	-	2	-	-	-	-	-	
Basic Carbon Frontier	07-08-82	6	-	-	-	2	2*	-	-	-	-	-	-	-	-	-	-	-	-	-	
Bronze Silbergeld	07-08-82	2	-	-	-	2	-	-	-	-	-	2	2	-	-	-	-	-	-	-	
Junk Yard New Road	07-08-82	4	-	-	-	2	2*	-	-	-	-	-	2	-	2	-	-	-	-	-	
	07-08-82	-	3	3	-	-	3*	-	-	-	3	3	3	-	3	-	-	-	-	-	

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NOTE: Dash (-) means not analyzed for.

\* Analyses performed by Mead Compu Chem, Inc., Research Triangle Park, N.C. total (number by Mead\*). All other analyses performed by U.S.G.S. (United States Geological Survey).

TABLE B.1 (Continued)

SITE NAME AND NUMBER	FIRST SAMPLING DATE	TEST HOLES DRILLED	EXISTING WELLS	NUMBER OF WATER SAMPLES		NUMBER OF SEDIMENT SAMPLES	GC/MS EXTRACTABLES	NUMBER OF SAMPLES FOR EACH PARAMETER												
				Ground water	Surface water			Volatiles	As	Cd	Cr	Cu	Fe	Pb	Hg	Ni	V	Zn	Cn	S
D1Bacco (Old Creek bed)	07-09-82	-	-	-	4	-	4*	-	-	-	-	3	3	3	4	-	-	-	-	-
Dunlop Tire and Rubber(125,6,7)	07-09-82	4	-	-	-	4	4*	-	-	-	-	-	-	-	-	-	-	-	-	-
Forebay of PASNY	07-10-82	2	-	-	-	2	2*	-	1	1	1	1	1	1	1	1	1	1	1	-
City of Tonawanda Dump	07-10-82	8	-	2	2	6	10 ( 3*)	-	-	-	7	-	7	-	-	-	-	-	-	-
Griffon Park	07-12-82	4	-	1	-	4	5*	-	-	-	-	5	5	-	5	-	-	-	-	-
Allied Chemical(108)	07-13-82	3	-	1	1	2	4*	-	-	-	-	-	-	-	-	-	-	-	-	-
Allied Chemical(110)	07-13-82	3	-	-	-	3	3*	-	-	-	-	-	-	-	-	-	-	-	-	-
Allied Chemical(109)	07-14-82	1	-	1	1	1	3*	1	1	1	1	1	1	1	1	-	-	1	-	-
Airco Speer	07-14-82	4	-	-	-	4	4*	-	-	-	-	-	-	-	-	-	-	-	-	-
Huntley Power Station	07-15-82	18	-	-	2	18	19*	-	19	19	19	-	19	19	19	19	-	-	-	-
Leigh Valley Railroad	07-19-82	20	-	-	-	20	-	-	-	-	20	20	20	20	-	20	-	-	-	-
Allied Chemical(107)	07-19-82	-	3	3	-	-	-	-	-	-	3	3	3	3	-	3	3	-	-	3
Chemical Leaman	-	-	3	3	-	-	3*	-	-	-	-	-	-	-	-	-	-	-	-	-
Allied Chemical(105)	07-20-82	4	-	-	-	4	4*	-	4	4	4	-	4	4	4	4	-	-	-	-
Aluminum Match Plate	07-20-82	4	-	-	-	4	-	-	-	-	-	4	-	-	4	-	-	-	-	-
Spauling Fibre	07-21-82	4	-	-	-	4	-	-	-	-	-	-	3	-	-	-	-	3	-	-
Remco Steel	07-22-82	3	-	-	2	3	-	-	-	-	6	6	6	6	-	-	-	-	-	-
Republic Steel	07-22-82	-	7	6	1	-	7*	-	-	-	6	6	-	6	-	-	-	-	-	-
NFTA(092)	07-27-82	2	-	-	-	2	2*	-	-	-	-	-	-	-	-	-	-	-	-	-
Adams Generating Plant	07-27-82	4	-	-	-	4	4*	-	-	-	4	4	4	-	4	-	-	-	-	-
Anaconda	07-28-82	4	-	-	-	4	4*	-	4	4	4	4	4	4	4	-	-	4	-	-
J.H. Williams	07-29-82	4	-	-	-	4	4 ( 3*)	-	-	-	-	-	4	4	-	-	-	-	-	-

NOTE: Dash (-) means not analyzed for.

\* Analyses performed by Mead Compu Chem, Inc., Research Triangle Park, N.C. total (number by Mead\*). All other analyses performed by U.S.G.S. (United States Geological Survey).

TABLE B.1 (Continued)

SITE NAME AND NUMBER	FIRST SAMPLING DATE	TEST HOLES DRILLED	EXISTING WELLS	NUMBER OF WATER SAMPLES		NUMBER OF SEDIMENT SAMPLES	GC/MS EXTRACTABLES	NUMBER OF SAMPLES FOR EACH PARAMETER													
				Ground water	Surface water			Volatiles	As	Cd	Cr	Cu	Fe	Pb	Hg	Ni	V	Zn	Cn	S	
Squaw Island	07-29-82	8	-	-		8	8 ( 2*)	-	-	-	6	6	6	-	-	-	-	-	-	-	
Empire Waste	07-30-82	4	-	-		4	-	-	4	4	4	4	4	4	4	-	-	4	-	-	
Lucidol																					
Division	07-30-82	4	-	-		4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	
Hanna Furnace	08-02-82	7	-	-		8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
FMC	08-04-82	4	-	-		4	-	-	-	-	4	4	4	4	-	4	-	-	-	-	
Strausmann	08-04-82	4	-	-		4	4	-	-	-	-	4	-	-	-	-	-	4	-	-	
NFPA	08-05-82	4	-	-		4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MacNaughton Brooke	08-05-82	4	-	-		4	-	-	-	4	4	4	4	4	-	-	-	-	-	-	
Donner Hanna						4	-	-	-	4	4	-	4	4	-	-	-	-	-	-	
Coke	08-05-82	4	-	-		4	-	-	-	-	-	4	-	-	-	-	-	-	-	4	
Mansel Division	08-06-82	4	-	-		4	4*	-	-	-	-	4	4	4	-	4	-	-	-	-	
Mobil Oil	08-06-82	4	-	-		4	4*	-	-	-	-	-	4	4	-	-	-	-	-	-	
Olin Parking Lot	08-09-82	4	-	-		4	4*	-	-	-	-	-	4	-	-	-	-	-	-	-	
Olin Mercury Pond	08-09-82	6	-	-		6	6*	-	-	-	-	4	-	-	4	-	-	-	-	-	
Roblin Steel	08-10-82	1	-	-		1	6*	-	1	1	1	1	1	1	1	-	-	1	-	-	
INS Equipment																					
Corp.	08-10-82	10	-	-		10	10*	-	-	10	10	-	10	10	-	-	-	-	-	-	
R.P. Adams	08-11-82	4	-	-		4	4	-	-	-	-	-	4	4	-	-	-	-	-	-	
64th Street																					
South(885)	08-11-82	2	-	-		2	2 ( 1*)	-	-	-	-	-	2	2	-	-	-	-	-	-	
Allied Murwitz and																					
Ranne(249)	08-11-82	6	-	-		6	-	-	-	6	-	6	-	-	-	-	-	-	-	-	
St. Marys School	08-12-82	3	-	-		3	3*	-	-	-	-	-	3	-	3	-	-	-	-	-	
Stauffer Chemical,																					
PASNY	08-12-82	4	-	-		4	4 ( 1*)	-	4	4	4	4	4	4	4	4	-	4	-	-	
Dupont	08-18-82	-	7	8		-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	
Modern Disposal	08-19-82	-	2	2		-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	
Union Carbide	08-20-82	-	3	2		-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	
Tonawanda Creekside																					
Golf Course	08-25-82	3	-	2		3	5	-	-	-	-	-	-	-	-	-	-	-	-	-	
West Seneca Trans-																					
fer Station	08-26-82	4	-	-		4	5	-	5	5	5	5	5	5	5	5	-	-	-	-	
97th St. Methodist																					
Church	08-27-82	4	-	1		4	5	-	-	-	-	4	-	4	-	-	-	-	-	-	
Otis Elevator	08-30-82	8	-	-		1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cayuga Island	01-12-83	1	-	1		-	1	-	-	1	1	1	1	1	-	-	-	1	-	-	
Hydraulic Canal	01-14-83	1	-	1		-	1	-	-	-	-	1	1	-	-	-	-	-	-	-	
Totals	76 Sites	316	38	62	19	255	265 (141*)	6	54	83	151	144	233	136	114	80	4	31	5	3	

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NOTE: Dash (-) means not analyzed for.

\* Analyses performed by Mead Compu Chem, Inc., Research Triangle Park, N.C. total (number by Mead\*). All other analyses performed by U.S.G.S. (United States Geological Survey).

TABLE B.2

MEAN PRIORITY POLLUTANT CONCENTRATIONS IN GROUNDWATER SAMPLES AT SIGNIFICANT HAZARDOUS SITES

Sub-Area		BUFFALO - LACKAWANNA					
		Lake Erie			Buffalo River		
Segment		Site 118	Site 162	Site 241	Site 141	Site 138	Site 107
		Bethlehem	Alltiff	Times Beach	Mobil	McNaughton	Allied
		Steel		Dredge Spoil	Oil	Brooks	Chemical
Facility		ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Categories/Parameters					1/	1/	1/
ACID/PHENOLICS							
2-Chlorophenol				13			
2,4-Dichlorophenol							
Pentachlorophenol							
Phenol							
2,4,5-Trichlorophenol							
2,4 Dimethyl phenol							
BASE NEUTRALS							
Acenaphthene							
Acenaphthylene							
Benzo (a)anthracene							
Benzo (a)pyrene							
Benzo (b)fluoranthene							
Benzo (g,h,i)perylene							
Benzo (k)fluoranthene							
Bis (2-ethylhexyl)phthalate				37			
Butylbenzylphthalate							
2-Chloronaphthalene							
Chrysene							
1,2-Dichlorobenzene				76.7			
1,3-Dichlorobenzene				7.3			
1,4-Dichlorobenzene				56.3			
Diethylphthalate							
Di-n-butylphthalate							
Di-n-octylphthalate							
Fluoranthene							
Fluorene							
Hexachlorobenzene							
Hexachlorobutadiene							
Hexachlorocyclopentadiene							
Hexachloroethane							
Naphthalene	100			33.3			
Phenanthrene							
Pyrene							
1,2,4-Trichlorobenzene				25.7			
PURGEABLES							
Benzene	4			141			
Carbon tetrachloride							
Chlorobenzene				1743			
Chloroethane							
Chloroform							
1,1-Dichloroethane							
1,2-Dichloroethane							
1,1-Dichloroethylene							
Trans-1,2-dichloroethylene							
1,2-Dichloropropane							
Trans-1,3-dichloropropene							
Ethylbenzene				29.7			
Methylene chloride							
1,1,2,2-Tetrachloroethane							
Tetrachloroethylene							
Toluene	1			7.6			
1,1,1-Trichloroethane							
1,1,2-Trichloroethane							
Trichloroethylene							
Trichlorofluoromethane							
Vinyl chloride							
PESTICIDES							
Alpha BHC							
Beta BHC							
Gamma BHC							
Delta BHC							
Endrin aldehyde							
Heptachlor							
PCBs							
METALS, TOTAL							
Antimony				8			
Arsenic	30		10.7	67.3			
Beryllium							
Cadmium				10.2			
Chromium			10	223			
Copper			43	472			84.6
Lead	120			1331			173.6
Mercury			3.2	0.3			
Nickel				219			373
Selenium							
Silver			2				
Thallium							
Zinc	155			261,000			
CYANIDES, TOTAL	160						
OTHER	2/	2/	2/			2/	

Notes: 1/ No water data available. 2/ See text for other parameters.



TABLE B.2 (Continued)

Sub-Area	Bird	Black
	Island/	Rock
Segment	Riverside	Canal
	Site 203	None
	Squaw	
	Island	
Facility	ug/l	
Categories/Parameters	1/	
ACID/PHENOLICS		
2-Chlorophenol		
2,4-Dichlorophenol		
Pentachlorophenol		
Phenol		
2,4,5-Trichlorophenol		
2,4 Dimethyl phenol		
BASE NEUTRALS		
Acenaphthene		
Acenaphthylene		
Benzo (a)anthracene		
Benzo (a)pyrene		
Benzo (b)fluoranthene		
Benzo (g,h,i)perylene		
Benzo (k)fluoranthene		
Bis (2-ethylhexyl)phthalate		
Butylbenzylphthalate		
2-Chloronaphthalene		
Chrysene		
1,2-Dichlorobenzene		
1,3-Dichlorobenzene		
1,4-Dichlorobenzene		
Diethylphthalate		
Di-n-butylphthalate		
Di-n-octylphthalate		
Fluoranthene		
Fluorene		
Hexachlorobenzene		
Hexachlorobutadiene		
Hexachlorocyclopentadiene		
Hexachloroethane		
Naphthalene		
Phenanthrene		
Pyrene		
1,2,4-Trichlorobenzene		
PURGEABLES		
Benzene		
Carbon tetrachloride		
Chlorobenzene		
Chloroethane		
Chloroform		
1,1-Dichloroethane		
1,2-Dichloroethane		
1,1-Dichloroethylene		
Trans-1,2-dichloroethylene		
1,2-Dichloropropane		
Trans-1,3-dichloropropene		
Ethylbenzene		
Methylene Chloride		
1,1,2,2-Tetrachloroethane		
Tetrachloroethylene		
Toluene		
1,1,1-Trichloroethane		
1,1,2-Trichloroethane		
Trichloroethylene		
Trichlorofluoromethane		
Vinyl Chloride		
PESTICIDES		
Alpha BHC		
Beta BHC		
Gamma BHC		
Delta BHC		
Endrin aldehyde		
Heptachlor		
PCBs		
METALS, TOTAL		
Antimony		
Arsenic		
Beryllium		
Cadmium		
Chromium		
Copper		
Lead		
Mercury		
Nickel		
Selenium		
Silver		
Thallium		
Zinc		
CYANIDES, TOTAL		
OTHER		

Notes: 1/ No water data available. 2/ See text for other parameters.

TABLE B.2 (Continued)

Sub-Area	TONAWANDA - NORTH TONAWANDA						
Segment	Tonawanda - North Tonawanda						
	Site 105	Site 108	Site 136	Site 182	Site 123	Site 24-37	Site 68
	Allied	Tonawanda	INS	Huntley	Columbus	Occ. Chem.	Gratwick-
Facility	Chemical	Coke	Equip.	Power	McKinnon	Durez	Riverside
	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Categories/Parameters	1/		1/	1/	1/		
ACID/PHENOLICS							
2-Chlorophenol							
2,4-Dichlorophenol							
Pentachlorophenol							
Phenol							
2,4,5-Trichlorophenol							405
2,4 Dimethyl phenol							1
BASE NEUTRALS							
Acenaphthene							
Acenaphthylene							
Benzo (a) anthracene							
Benzo (a) pyrene							
Benzo (b) fluoranthene							
Benzo (g,h,i) perylene							
Benzo (k) fluoranthene							
Bis (2-ethylhexyl) phthalate							2
Butylbenzylphthalate							4
2-Chloronaphthalene							
Chrysene							
1,2-Dichlorobenzene						380	
1,3-Dichlorobenzene						130	
1,4-Dichlorobenzene						440	
Diethylphthalate							
Di-n-butylphthalate							
Di-n-octylphthalate							
Fluoranthene							
Fluorene							
Hexachlorobenzene							
Hexachlorobutadiene							
Hexachlorocyclopentadiene							
Hexachloroethane							
Naphthalene							10.1
Phenanthrene							
Pyrene							
1,2,4-Trichlorobenzene						61	
PURGEABLES							
Benzene							
Carbon tetrachloride							
Chlorobenzene						33,800	
Chloroethane							
Chloroform							
1,1-Dichloroethane							
1,2-Dichloroethane							
1,1-Dichloroethylene							
Trans-1,2-dichloroethylene							
1,2-Dichloropropane							
Trans-1,3-dichloropropene							
Ethylbenzene							
Methylene chloride							
1,1,1,2-Tetrachloroethane							
Tetrachloroethylene							
Toluene						200	
1,1,1-Trichloroethane							
1,1,2-Trichloroethane							
Trichloroethylene							
Trichlorofluoromethane							
Vinyl chloride							
PESTICIDES							
Alpha BHC							
Beta BHC							
Gamma BHC							
Delta BHC							
Endrin aldehyde							
Heptachlor							
PCBS							
METALS, TOTAL							
Antimony							
Arsenic							
Beryllium							
Cadmium							
Chromium							
Copper							
Lead							99
Mercury							
Nickel							7
Selenium							
Silver							
Thallium							
Zinc							
CYANIDES, TOTAL			280				
OTHER							4/

Notes: 1/ No water data available. 2/ See text for other parameters.

TABLE B.2 (Continued)

Sub-Area	NIAGARA FALLS, N.Y.						
	Wheatfield - Upper River						
Segment	Site 81 NCRDD 3/	Site 56 Olin 102nd St.	Site 38 Occ. Chem. Love Canal	Site 40 Occ. Chem. 102nd St.	Site 85 Griffon Park	Site 5 Bell Aerospace Textron	Site 242 Charles Gibson
Facility	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Categories/Parameters	1/						1/
ACID/PHENOLICS							
2-Chlorophenol							
2,4-Dichlorophenol			507	75			
Pentachlorophenol							
Phenol	34,000		3	44			
2,4,6-Trichlorophenol			734				
2,4 Dimethyl phenol							
BASE NEUTRALS							
Acenaphthene	307						
Acenaphthylene	292						
Benzo (a) anthracene							
Benzo (a) pyrene	748						
Benzo (b) fluoranthene	729						
Benzo (g, h, i) perylene	729						
Benzo (k) fluoranthene							
Bis (2-ethylhexyl) phthalate	343						
Butylbenzylphthalate	310						
2-Chloronaphthalene							
Chrysene	645						
1,2-Dichlorobenzene	90		130	5,900			
1,3-Dichlorobenzene	78			23,000			
1,4-Dichlorobenzene	78		190	)			
Diethylphthalate	184						
Di-n-butylphthalate	171						
Di-n-octylphthalate	372						
Fluoranthene	524						
Fluorene	350						
Hexachlorobenzene	403						
Hexachlorobutadiene							
Hexachlorocyclopentadiene							
Hexachloroethane							
Naphthalene	166						
Phenanthrene							
Pyrene	539						
1,2,4-Trichlorobenzene	163			23,000 4/			
PURGEABLES							
Benzene			430	7,700		66	
Carbon tetrachloride							
Chlorobenzene			500	3,000			
Chloroethane							
Chloroform			62	13,000		910	
1,1-Dichloroethane						140	
1,2-Dichloroethane						15	
1,1-Dichloroethylene			0.5			375	
Trans-1,2-dichloroethylene	37		8.5			14,000	
1,2-Dichloropropane							
Trans-1,3-dichloropropene						27	
Ethylbenzene	8		11			26	
Methylene chloride	2					125,000	
1,1,2,2-Tetrachloroethane			267	5,700			
Tetrachloroethylene	56		186.5	12,700		38	
Toluene	31		475	17,700		65	
1,1,1-Trichloroethane						630	
1,1,2-Trichloroethane			11				
Trichloroethylene	8		157	5,000		420,000	
Trichlorofluoromethane						15,000	
Vinyl chloride	2					665	
PESTICIDES							
Alpha BHC			5	106			
Beta BHC				)			
Gamma BHC			17				
Delta BHC							
Endrin aldehyde	.08						
Heptachlor							
PCBs							
METALS, TOTAL							
Antimony							
Arsenic	25			40			
Beryllium						6	
Cadmium						59	
Chromium							
Copper	0.9						
Lead				140	140		
Mercury	1.1			6	1.3		
Nickel	0.01				62		
Selenium							
Silver							
Thallium							
Zinc	25			420	3920		
CYANIDES, TOTAL							
OTHER							
				2/			

Notes: 1/ No water data available. 2/ See text for other parameters. 3/ Drainage ditch. 4/ Includes all trichlorobenzenes.

TABLE B.2 (Continued)

NIAGARA FALLS, N.Y.							
Wheatfield - Upper River							
Sub-Area							
Segment	Site 83 Buffalo Ave.	Site 14 duPont Necco Park	Site 41 Hooker "S-Area"	Site 41a-49 Hooker Buffalo Ave.	Site 251 Solvent Chemical	Site 15-19,250 duPont Buffalo Ave.	Site 58,59,248 Olin Buffalo Ave.
Facility	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Categories/Parameters							
ACID/PHENOLICS							
2-Chlorophenol							56
2,4-Dichlorophenol							23
Pentachlorophenol							
Phenol			1,184			2.8	
2,4,6-Trichlorophenol			257				
2,4 Dimethyl phenol							
BASE NEUTRALS							
Acenaphthene							
Acenaphthylene							
Benzo(a)anthracene	2,000						
Benzo(a)pyrene	1,400						
Benzo(b)fluoranthene	1,325						
Benzo(g,h,i)perylene							
Benzo(k)fluoranthene	1,170					9.2	
Bis(2-ethylhexyl)phthalate						5.8	
Butylbenzylphthalate							
2-Chloronaphthalene							
Chrysene	3,100						
1,2-Dichlorobenzene			)	)	35,070	2.8	
1,3-Dichlorobenzene			1,758	15,830	4,770		
1,4-Dichlorobenzene			)	)	19,790	2.6	
Diethylphthalate						5.6	
Di-n-butylphthalate							
Di-n-octylphthalate							
Fluoranthene	4,750						
Fluorene							
Hexachlorobenzene			5,319				
Hexachlorobutadiene		14,600	4,995				
Hexachlorocyclopentadiene			2,400				
Hexachloroethane			912			56	
Naphthalene							
Phenanthrene	4,750						
Pyrene	4,700						
1,2,4-Trichlorobenzene			11,318	44	8,780		
PURGEABLES							
Benzene		267	1,799		32,500	8.8	
Carbon tetrachloride		25,703	1,496				
Chlorobenzene			1,781	255	35,690	0.9	
Chloroethane							
Chloroform		18,333	530			32,233	
1,1-Dichloroethane							
1,2-Dichloroethane							
1,1-Dichloroethylene		243					
Trans-1,2-dichloroethylene		2,730	162			5,856	
1,2-Dichloropropane							
Trans-1,3-dichloropropene							
Ethylbenzene							
Methylene chloride		1,967				464,462	
1,1,2,2-Tetrachloroethane		11,333				64,215	
Tetrachloroethylene		12,733	5,621	7,120		10,044	
Toluene		245	588	3,820		410	
1,1,1-Trichloroethane							
1,1,2-Trichloroethane		6,433					
Trichloroethylene		25,667	1,774	71,790		522,247	
Trichlorofluoromethane							
Vinyl Chloride							
PESTICIDES							
Alpha BHC						10	1,285
Beta BHC						9.69	
Gamma BHC							1,248
Delta BHC						1.64	
Endrin aldehyde							
Heptachlor						0.13	
PCBS							
METALS, TOTAL							
Antimony						1.1	
Arsenic						9.7	
Beryllium						2.5	
Cadmium						2.2	
Chromium						7	
Copper						18	
Lead						105	
Mercury						2	13.5
Nickel						8.8	
Selenium						0	
Silver						0	
Thallium							
Zinc					36,840	3,644	
CYANIDES, TOTAL							
						626	
OTHER			2/	2/	2/	2/	2/

Notes: 1/ No water data available. 2/ See text for other parameters.

TABLE B.2 (Continued)

Sub-Area	NIAGARA FALLS, N.Y.	
	Wheatfield- Upper River	Lower River
Segment	Site 66 Reichhold Varcum ug/l	Site 39 Hooker Hyde Park ug/l
Facility		
<b>Categories/Parameters</b>		
<b>ACID/PHENOLICS</b>		
2-Chlorophenol		
2,4-Dichlorophenol		534
Pentachlorophenol		
Phenol		342,000
2,4,6-Trichlorophenol		
2,4 Dimethyl phenol		
<b>BASE NEUTRALS</b>		
Acenaphthene		
Acenaphthylene		
Benzo (a) anthracene		
Benzo (a) pyrene		
Benzo (b) fluoranthene		
Benzo (g,h,i) perylene		
Benzo (k) fluoranthene		
Bis (2-ethylhexyl) phthalate		31
Butylbenzylphthalate		
2-Chloronaphthalene		2
Chrysene		
1,2-Dichlorobenzene		
1,3-Dichlorobenzene		
1,4-Dichlorobenzene		
Diethylphthalate		
Di-n-butylphthalate		
Di-n-octylphthalate		
Fluoranthene		
Fluorene		
Hexachlorobenzene		103
Hexachlorobutadiene		272
Hexachlorocyclopentadiene		
Hexachloroethane		321
Naphthalene		
Phenanthrene		
Pyrene		
1,2,4-Trichlorobenzene		282
<b>PURGEABLES</b>		
Benzene		360
Carbon tetrachloride		302
Chlorobenzene		642
Chloroethane		16
Chloroform		951
1,1-Dichloroethane		
1,2-Dichloroethane		361
1,1-Dichloroethylene		39
Trans-1,2-dichloroethylene		74
1,2-Dichloropropane		3
Trans-1,3-dichloropropene		
Ethylbenzene		310
Methylene chloride		401
1,1,2,2-Tetrachloroethane		24
Tetrachloroethylene		942
Toluene		2,311
1,1,1-Trichloroethane		1
1,1,2-Trichloroethane		59
Trichloroethylene		531
Trichlorofluoromethane		13
Vinyl chloride		
<b>PESTICIDES</b>		
Alpha BHC		)
Beta BHC		)19
Gamma BHC		)
Delta BHC		)
Endrin aldehyde		
Heptachlor		
<b>PCBs</b>		
<b>METALS, TOTAL</b>		
Antimony		65
Arsenic		36
Beryllium		
Cadmium		
Chromium		246
Copper		1,027
Lead		1,199
Mercury		
Nickel		240
Selenium		11
Silver		
Thallium		40
Zinc		31,096
<b>CYANIDES, TOTAL</b>		
OTHER	2/	2/

Notes: 1/ No water data available. 2/ See text for other parameters.